Loot boxes and digital gaming: a rapid evidence assessment

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Authors

Darshana Jayemanne

Shiona Chillas

Jim Moir

Augusto Rocha

Fraser Simpson

Heather Wardle

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Declarations:

Darshana Jayemanne has served as jurist for the Independent Game Festival's Award in Narrative Excellence from 2019. Judging is accompanied with a pass to the yearly Game Developer Conference.

Executive Summary

Introduction

- Loot boxes are increasingly prevalent within digital games. They are underpinned by **randomised reward mechanisms** (RRMs) which alongside **emerging business models** has led to concern that they are a form of gambling that exist outside of current regulatory frameworks.

- The Department for Digital, Culture, Media and Sport (DCMS) recognise this and launched an open call for evidence on the impact of loot boxes. In addition, they commissioned this Rapid Evidence Assessment (REA) to explore whether loot boxes encourage problematic play behaviours, with particular focus on the key characteristics of the loot box market nationally and internationally, and to further understand if and how loot boxes are associated with harms and what the drivers of harm may be.

- The REA ran for 10 weeks from February to March 2021.

Methods

- Opening a loot box is designed to seem like a simple act, but is actually a complex technological, legal, physiological, psychological and cultural event. To help unpack this complexity, this REA examined existing academic literature on loot boxes through two workflows:
  - a **Market Analysis** and,
  - an assessment of **Drivers of Problematic Play**

- These workflows were supplemented with expert interviews and perspectives from game designers and producers of children's content. This includes three senior game developers with credits on multiple games, and two experts in children's media culture who offer a longitudinal point of view outside the games industry. These insights have been collated into an **Expert Primer** on loot boxes.

- For both scholarly workflows, a REA was conducted. REA draw on systematic review methods but are conducted within shorter time frames; discussing less literature in less depth. However, REAs are a recommended methodology for providing policy

relevant insight and their constrained timescales do not impact on conclusions when compared with full systematic methods.

Findings

- The **Market Analysis** found that loot boxes are a convergence of **user-retention strategies** and **data analytics** with **RRMs** which have long been part of game design. Monetisation can sometimes be a downstream consideration in free-to-play games, with loot boxes having the ability to stabilise existing user numbers through incentivising re-engagement, pacing the development and release of new content, and other potential benefits for developers. However, the use of 'sticky' design techniques and the randomisation of rewards combined with microtransactions has led to comparisons to gambling (particularly where third-party sites allow trading of loot box rewards beyond the intentions of developers). Furthermore, **there are concerns about how user data is used**, potentially manipulating the way loot boxes are offered to different individuals, and how data is sold on.

- There is very little reliable information about the size and scale of the loot box market both internationally and within the UK.

- There are **many different types of loot boxes** available within digital games, that are used in different ways. Better understanding of the range and circumstances in which loot boxes are used by game designers and players is needed.

- The **Drivers of Problematic Play** search found 15 studies which **empirically correlated loot box use with problem gambling**. These studies showed a stable and consistent association between use of loot box use and problem gambling. There is also emerging evidence of a dose response relationship, whereby greater loot box spending is related to greater problem gambling severity.

- However, **this empirical work is emerging** and has tended on concentrate on replicating findings rather than exploring and understanding the drivers of this association. **There are a range of plausible explanations that could underpin this association**. These include that loot box purchases are heavily engaged in a range of gambling activities; that other factors, like impulsivity, drive this association; that

loot box purchases exhibit maladaptive motives for their use; or that loot box purchase itself leads to gambling-related harms.

- **Evidence exploring the boundaries of this association is in its infancy.** Only two studies identified took into account a range of other measures; one found that broader gambling behaviours explained the relationship between loot box purchasing and problem gambling, and one found that the relationship persistent even after broader gambling and impulsivity were taken into account.

- There is an evidence base starting to emerge looking at other harms associated with loot box use. This includes associations with problem gaming (broadly consistent evidence from the few studies identified); associations with wellbeing, anxiety and depression; and perceptions from young people that loot boxes themselves are addictive.

Recommendations

- The research on loot boxes to date is scarce – however, our review identified **a pattern of findings that correlate loot box usage with problem gambling**. Importantly, these studies are **cross-sectional and correlational**. We do not know from the literature the **directionality or causality** of the relation observed between loot box spend and problem gambling, or indeed that a causal relationship exists - it is plausible that another set of relationships or behaviours may be driving this association (the **third variable** effect). This work needs to be developed.

- In the wider literature on loot boxes, **empirical studies** of loot box history, business models, definitions and typologies are under-developed. Loot boxes are a particular implementation of a more general phenomenon that have been termed **'Random Reward Mechanisms'** (RRMs). One influential typology defines **four types of RRMs**, arguing that one of these four types constitutes gambling. This position has been critiqued by other scholars who argue that three of the four types of RRM potentially constitute gambling. The main point of contention is **whether or not random rewards can be 'cashed out' for real-world currency** and whether third-parties that may facilitate cashing out are included in the analysis. This indicates some of the

complexity inherent in loot boxes, and is part of the reason for the lack of empirical data: loot boxes, like other discrete components of digital games, are poorly defined and hence difficult to disaggregate from the wider market data.

- We are at the beginning of learning about potential harms and how they relate to particular implementations of loot boxes. Furthermore, the COVID-19 pandemic and lockdown is a major event which has deeply affected people's engagement with digital technologies like games – and hence, loot boxes. At this stage we have only one study (Hall et al, 2021) that has tried to reckon with this.

- This incomplete picture indicates that a cautious approach to regulation of loot boxes is important; however it also **does not mean that nothing can or should be done**. We advocate an expanded approach to loot boxes that incorporates **consumer protection** frameworks. This wider approach would afford a range of tools, from recommendations or guidelines to binding statutes, that gives latitude for action if emerging investigation into potential third variables and causality are found and replicated in studies into links between problem gambling and loot boxes. It will also help to ensure a measured approach to game developers of different sizes who make different kinds of games, different populations of players with different risks, and address potential concerns and risks that the narrow focus on gambling has perhaps sidelined, such as **data protection**. In our expert interviews, **seasoned game developers suggested that such an approach would be valuable**, helping them to create better online communities, manage risk, and work towards new designs.

- Principles towards future ethical loot box design could include:

  1. A minimum age informed by science, government and industry should be established for engaging in games involving loot boxes.

  2. Games involving loot boxes clearly and unambiguously inform players that loot boxes involving microtransactions are included in the game but are NOT an essential requirement for playing these games. Players may decline to use them without penalty.

  3. It should be made clear at the point of purchase that loot box items do not guarantee a direct path to success in a game.

4. It should also be made clear the extent to which the delivery of loot box items is random in nature, and that loot boxes are prominently labelled with content ranges and % chances clearly displayed.

5. Loot box contents, or chances are not pre-determined or targeted based on player behaviour.

6. After a set number of purchases (e.g., after every fourth), players are informed via an on-screen message that this is their fourth, eighth, etc. purchase and that they should pause to consider how much they have spent at that point and if they wish to continue.

7. Players are informed via an on-screen message when sudden spikes in spending activity occur, encouraging them to pause to consider if they wish to continue.

8. Players should be advised to take regular breaks and that this message appears on screen after each hour (or appropriate session length) of play.

9. Developers and publishers should operate generous refund policies (e.g. all spend for the last *n* days), and players have a clear path to obtain this and to self-exclude.

10. Developers should allow access to a tally of recent spend in the user's profile to allow players to make more informed decisions about their spending.

11. Players should be able to view estimated average spend amounts to level up or max out a character (or similar upgradable item), in order to make better value judgements and manage expectations.

12. Games companies should ensure that their likely first point of contact with players experiencing distress due to loot boxes or other spends are appropriately trained to offer support and informed as to possible methods for redress/refund. As the precise division of roles varies between studios, key personnel should be identified who can lead on this.

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Background

This Rapid Evidence Assessment (REA) was commissioned by the UK Department for Digital, Culture, Media and Sport (DCMS) and ran over 10 weeks from February to March 2021. The work responds to discussion and controversy around 'loot boxes'. This term has been loosely used to designate a set of game mechanics and business models that have become increasingly common in digital games over recent years, particularly as mobile, social and live operations features have become more integral to games industry and culture.

Loot boxes 'are extremely diverse' (Zendle et al, 2020, 181) components of a 'constantly evolving ecosystem' (Close et al, 2021, 4). They generally provide players with a random chance to receive virtual rewards after meeting certain requirements. Requirements may be a certain amount of time playing the game (time-gating), direct ('in-app') purchase with real or in-game currency, or skilful play. The rewards take various forms, but commonly may be: 'skins' (looks for a character), lowered 'cooldowns' (timers influencing progression in the game), artwork, fantasy or celebrity characters, or in-game currencies. Loot boxes may actually resemble gift-wrapped 'boxes', but they may take other audio-visual forms (luminous crystals, eggs which hatch, virtual *piñatas*, clocks or countdowns) according to the game's theme. Often the reveal of the loot box contents are accompanied by dazzling virtual fireworks and audio cues, and the rarity of the random loot can be highly meaningful for players. 'Unboxing' videos in which streamers open loot boxes can garner millions of views (or far more likely, little to no attention whatsoever).

While they are often compared to surprise confectionaries, physical trading cards, scratch cards or raffle tickets, the randomisation techniques employed in loot boxes have also been critiqued as virtual gambling. These criticisms have come from third sector groups and other stakeholders, but also from within the games industry and the wider gaming community.

Concerns around loot boxes and gambling have informed legislative action in countries such as Belgium (Kansspelcommissie 2018), the Netherlands (Kansspelautoriteit 2018) and China (Xiao 2020). In the UK, loot boxes have been specifically mentioned as an area of concern in the 2019 Queen's Speech and a House of Lords report on gambling harms (2020). While

previous critiques of gaming (such as concerns about violent content) tended to aim at games as a whole, loot boxes may well be the first digital game *mechanic* to be discussed at such an eminent level. The Gambling Commission (2017) has also discussed loot boxes, finding that they are not gambling if the rewards cannot be 'cashed out' from the game into real-world currency, but this finding has been critiqued by groups such as Parent Zone (2019) because third-party sites exist for trading in-game items. The government's response to the DCMS Select Committee inquiry on *Immersive and Addictive Technologies* announced a Call for Evidence on Loot boxes. This ran from 23 September to 22 November 2020.

Subsequent to receiving evidence from stakeholders and the public, DCMS commissioned this Rapid Evidence Assessment (REA) to outline the current state of knowledge about loot boxes.

Primary and Secondary Questions

The primary research question of this REA is framed in light of the above background: "Do loot boxes encourage problematic play behaviours?"

The approach was broken down into two secondary searches, each guided by a subordinate research question: *Market Analysis*, which would tell us about how the literature defines and characterises loot boxes; and *Drivers of Problematic Play*, which would investigate empirical literature on potential harms arising from loot box use. The first search would be given terms to capture a broad set of papers to contextualise the work, while the second would be focused on harms to squarely address key questions from government and the wider community. A team was assigned to work semi-independently on each question, with results to be compared and compiled for the final report (some studies appeared in both searches and were cross-examined).

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The Secondary questions were as follows:

- **Market Analysis**: "What are the key characteristics of the loot box market nationally and internationally?"

- **Drivers of Problematic Play**: "What are the drivers of potential problematic play with regard to loot boxes in digital games?"

In addition to the systemic, rapid approach to the academic literature, a workflow was set up to gather evidence from practitioners. This resulted in three interviews with experts from the games industry who have had leading roles in the development of free-to-play and live service games. Given the key concerns around young people, we also spoke with Directors of Insight at the children-focused publisher Beano Studios. Unlike many games companies, Beano Studios is not a born-digital company and brings a different perspective. Along with material from these interviews, we have assembled discourse from games industry literature and conference proceedings to build an **Expert Primer** on loot boxes that can help readers unpick specialist thinking, context and language (Annex A).

This parallel approach was confirmed with DCMS, after which work began on review methodology.

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Systemic reviews and rapid reviews

Systematic reviews provide insight into the state of knowledge on a particular topic. Unlike other review types which may follow the preferences of specific researchers (such as the literature review common to the beginning of many academic projects), systemic reviews privilege transparent methodologies.

Rapid evidence assessments follow systematic review methodologies but are conducted in an expedited time frame. They are used to generate insight on emergent issues and are particularly focused on providing evidence for policy-makers within a shorter time frame than a standard systematic review (ranging from a few weeks to 6 months). In order to do this, the search is constrained by both time and by depth. In this rapid review, constraints were:

1) time, the review was conducted over a ten week period between February and March 2021.
2) depth: the review selected publications that had key search terms in the title or abstract before proceeding to full-text analysis;
3) range: the review focused on recent fully peer-reviewed papers and not grey literature such as preprints. However, as loot boxes are an emerging issue and following our exploratory searches, we are confident of capturing most pertinent studies.

These constraints meant that efficient search strategies were critical and this methodology should be kept in mind when interpreting this study. However, comparisons between rapid reviews and systematic review show that they tend to produce similar conclusions (Haby et al, 2016).

Each workflow followed these steps: Crafting of Search Strategy, Search Conducted, Data Extraction, Quality Assurance, and finally Narrative Synthesis. We will detail each in turn, and conclude by relating the findings from each search.

Rapid Assessment 1: Market Analysis

Methodology

This search was tasked with assessing scholarship on the size and characteristics of the market for loot boxes. Preliminary searches indicated a lack of studies and overall evidence to support the question on market-related information about loot boxes and microtransactions. The absence of empirical evidence supported the decision to include conceptual and conference proceeding papers. As the loot boxes literature is still in its early stages, a more comprehensive search protocol proved appropriate to maximise potential results. For the full search details, see Annex B. See Table 1 for a PRISMA diagram of the search.

Initial findings resulted in 281 publications. Outcomes from categorisation rounds resulted in three lists of publications: C (first round), B (second round), and A (final round). The initial C-list consisted of 281 publications from the initial search. The second round started with the removal of duplicates followed by titles, abstracts, and keywords analysis. Additionally, this screening included an initial quality assessment concentrating on focus, type of articles, access, and general quality.

For the final review round, a full assessment of 57 publications expanded the research focus, culminating in a final list of 34 articles used for this review section. This final round critically assessed full-texts aiming to eliminate publications missing a clear link with loot-boxes research (e.g., citing loot-boxes only as a game design strategy without investigating their development/impact).

The narrative synthesis was developed to maximise outputs from the A-list and was guided by the following questions:

1. What defines loot boxes, and what definitions have been used in research?
2. What is the scale of the use of loot boxes in games and their associated revenues?
3. Which companies/business models/platforms are known for loot box mechanisms?

The resulting list of publications showed a scarcity of academic evidence about the market for loot boxes and microtransactions. The following sections develop a narrative synthesis indicating what loot boxes represent for the academic literature and illustrate the need for future research in a focused analysis of the market.

Market Analysis
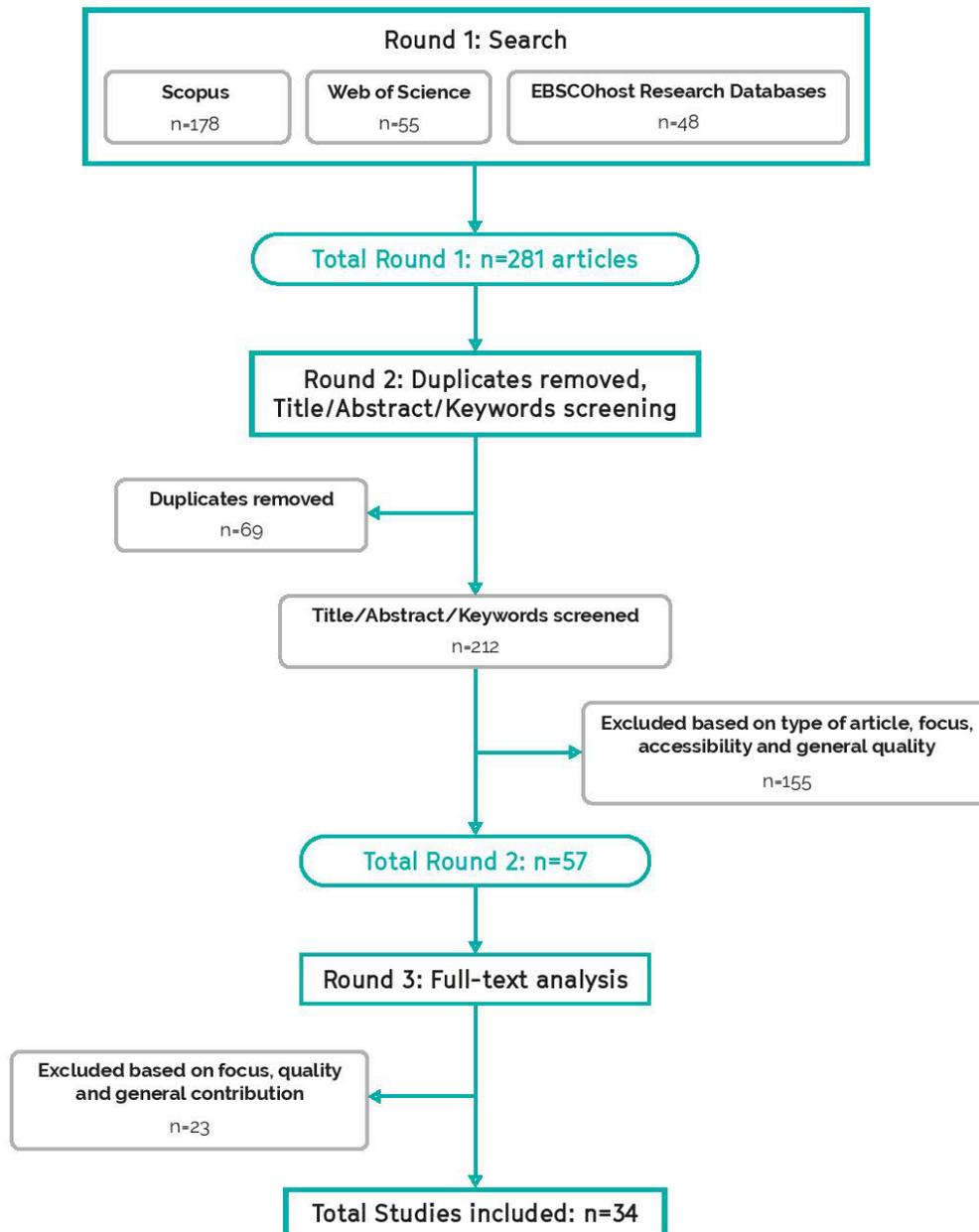
Figure 1: Market Analysis PRISMA

Results

Loot boxes are a relatively recent phenomenon, entering discourse around 2006. There is evidence that the use of the term "loot box" developed from the more general phenomenon of "Random Reward Mechanisms" (RRMs) that have been used in games since the early 1990s. RRMs operate similarly to other forms of chance such as collectible cards, toy dispensers known as *gacha*, and Kinder eggs, and can be traced back to 19th-century cigarette cards.

These mechanisms are based on the principles of desirable "free" products contained within another product which is sold and the nature of "the game" relies on blind purchases of random items. Using collectible cards as an example, buyers continue to pay for cards in the hope of finding the particular cards they want. The market for these goods operates with information asymmetry: sellers control availability, do not publish probability statistics and capitalise on buyers' desires.

While these antecedents of loot boxes are established and accept randomness as an element of play in physical and virtual games of chance, research indicates that "video games have been putting random items in treasure chests for decades" (Neely 2021). The nature of RRMs underpins the key distinction upon which the literature on loot boxes has coalesced.

Distinguishing and Classifying Loot Boxes

The randomness of reward is the key distinguishing feature of loot boxes around which all definitions agree. While randomness is the distinctive characteristic (Zendle, Meyer, and Over 2019) and loot boxes in video games hone chance to an "ostentatious glorification of randomness" (Nielsen and Grabarczyk 2019, 177), the literature divides on the precise definition of loot boxes.

The division centres on the mechanism of reward. Key distinguishing factors in definitions are: type (cosmetic versus integral/game improvement); currencies used (virtual vs. money); ubiquity (popular vs. niche) (Johnson and Brock 2020); access (reward for playing the game

well, a reward for sustained gameplaying) and exclusiveness (i.e., the player has no other way of acquiring items other than spending money) (D. L. King and Delfabbro 2020). Loot can equalise the playing field of the game by giving advantage to unskilled players (at a cost); or make the playing field less equal – those who don't have the money to buy loot will find it more challenging to progress. According to McCaffrey (2019),

> "[t]he most sought-after rewards are rare and, barring a run of good luck, can only be obtained by repeatedly opening loot boxes, which requires significant time or money. It is also usually possible——and likely——to receive duplicate or low-value loot, providing further incentives to keep trying for more valuable items. Opening a loot box is an event in itself and is typically accompanied by lights, sounds, and other effects intended to make the experience exciting." (p. 485)

The randomness of the reward becomes an element of playing the game and is thus incorporated in the experience that players expect from a video game.

Here it is helpful to make a distinction within the available definitions pertaining to loot boxes: a broader understanding of RRMs as "isolated from real-world economies" (Nielsen and Grabarczyk 2019, 172); and loot boxes as embedded in real-world economies. RRMs have been conceptualised in four types depending on the **Resources** players tender versus the potential **Reward**. These may be either (I) **Isolated from** or (E) **Embedded in** the real-world economy. This leads to four types:

- I-I non-purchasable and non-sellable, RRMs in single-player games (eg. *Diablo I*).
- I-E non-purchasable but sellable, RRMs that can be traded (eg. *Diablo III*).
- E-I purchasable but unsellable, RRMs that can be bought but not traded (eg. *Overwatch*).
- E-E purchasable and tradable (*PUBG*, *Team Fortress 2*, *CS:GO*).

The authors argue that only E-E type RRMs can be considered gambling. However, Xiao (2020) has argued against this position, pointing towards the FutGalaxy.com case. Here a third-party website meant that game currencies and rewards that were Isolated by design could in fact be traded (making them effectively Embedded in this case).

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Virtual currencies operating within a game are not straightforward; currencies can be spent within the game but also earned from the platform creator's store. Some are earned as rewards for gaming; others purchased with real currency. Often the exchange rate between virtual and real currency boosts the numerical value of the real currency (e.g., £1 equals 25 virtual equivalents) (D. L. King and Delfabbro 2019). Additionally, the game may use "limited time" offers, pressuring players into purchasing before a prescribed expiry time.

This complex constellation of incentives, currencies and transactions is a feature of the literature on loot boxes with assumptions made on acceptable features of a game, demands on game players imposed by the game, and indeed acceptable boundaries on investments in time, money and effort exacted by entering a virtual world. The transactions involved in games are more complex than purchase of a good. It is apparent that there are inconsistencies and divisions in the understanding, exposition and description of loot boxes as a phenomenon within gaming.

To illustrate these inconsistencies, Table 2 gives a classification of loot boxes developed by Cerulli-Harms et al, (2020). Following the conditions prescribed by Nielsen and Grabarczyk (2019), the table differentiates by eligibility to access, selection procedure, and the reward accruing from loot. This table highlights the variety in loot, cost, transparency and embeddedness in the game. It only recognises loot that is paid for in real-world currency. Although a useful starting point, this classification is only partial and raises more questions regarding the definition and enactment of the loot box mechanism. It emphasises different understanding and operationalisation of loot boxes and the complexity inherent in defining one element of a larger phenomenon. For example, a purely cosmetic reward such as camouflage may also give the player advantages in a game and adds different layers of value to the reward. *Value and valuation* is a fruitful lens for further analysis of loot box mechanisms in video games.

Irrespective of the broad or narrow definition of loot boxes suggested in Table 1, scrutiny in the literature has shifted focus from what loot boxes are, or may be, to the moral and ethical consequences of their implementation in games' dynamics (Brooks and Clark 2019).

The largely critical view prevalent in the literature hints at the exploitation of gamers through the use of this mechanism. A prevalent argument suggests that loot boxes socialise gambling behaviours and definitions increasingly include reference to gambling, such as: "Loot boxes represent a form of microtransaction in many video games that have some resemblance with gambling" (Kristiansen and Severin 2020, 1).

Figure 2 : Loot box classification. Source: Cerulli-Harms et al (2020)

Eligibility condition	
Access to loot boxes	
Gameplay, waiting time	Payment of real-world money, watching advertisements (both are usually options alongside gameplay
Cost of loot boxes	
Low: e.g., some gameplay (finishing a level), a few Euro (1 to 2 Euro)	High: e.g., heavy (several hours) and often repetitive gameplay (so-called grinding), costs of up to 100 Euro and more have been observed
Selection procedure	
Transparency	
Probabilities of obtaining different items are known to the player	Probabilities of obtaining different items are not known to the player
Probabilities of obtaining different items	
Different items have a similar likelihood to appear in a loot box.	Some items might be rare (e.g., appear in only 2% of cases) and others common (appear in 50% of cases).
Reward	
Content of loot boxes	
Purely cosmetic (customisation) e.g., looks of the player's character, etc	Affect gameplay e.g., tools, weapons, maps, 'super powers'

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Normalisation of Risk and the Growth of Data Analytics

This blurring of boundaries between gaming and gambling is underpinned by the increasing use and complexity of microtransactions inserted in games. The following section analyses the nature and scope of the market for games. Given the relative paucity of literature on loot boxes, and the complexities in defining this mechanism, market information is scarce and where it exists, not necessarily authoritative. Building on the previous section, we are therefore reluctant to offer secondary analyses of market information and preface this section with a note of caution regarding any figures that are presented. Nevertheless, this section reports on extant market information, reinforcing the difficulties in abstracting one element from the larger market for video games.

The online market for games as a form of entertainment increasingly blurs boundaries between "the physical and virtual, gaming and gambling, and chance-based and skill-based instances of play" (Ross and Nieborg 2021, 4). In an online environment, gambling as a practice has lost a proportion of its previous stigma, becoming "just one of many different entertainment options" (Ross and Nieborg 2021, 3).

This generalisation of risk, however, means that attempts to isolate a poorly understood and evidenced mechanism such as loot boxes from the wider market for games and gaming is almost artificial, sending policymakers down a 'regulatory rabbit hole' similar to extrapolating a regulatory framework from analysis of a slot machine's mechanics. Recent research shifts the focus onto loot boxes within the context of the "platformization of cultural production" (Nieborg and Poell 2018), looking holistically at tensions inherent in games that are "organized by boundaries between game/not-game, game/gambling game, skilled/unskilled play, consumption/production" (Whitson and French 2021, 1). For example, the act of triggering a random procedure/loot box can be part of the entertainment provided by the game (Kao 2020). The narrow extraction of one mechanism from economic flows that are difficult to trace and regulate within the broader picture of gamblification of online play (Zanescu, French, and Lajeunesse 2020).

Understanding current trends and best practices in the video games market is often a closely guarded secret in a sector characterised by high imitation levels and Intellectual

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Property. Large studios (e.g., Activision and Electronic Arts) have patented their loot box mechanisms to combat imitation and patents are a fruitful avenue for further research on the market for these mechanisms. Patent analysis may provide insights on consumer (player) behaviour that might otherwise require access to intellectual property held by studios (D. L. King et al, 2019). Similar to the information asymmetry between game developers and gamers on the probability of accessing loot, there is little information on which to assess or regulate the use of microtransactions (Xiao 2020).

Determining the loot box market's scale and scope are not straightforward due to rapid technological change. Moreover, the contentious nature of loot boxes means that "developers and publishers employ various discursive strategies in order to reframe the public discussion or divert attention away from these controversial monetization practices" (van Roessel and Švelch 2021, 198) effectively resisting disclosure of market information. "Game designers may be unwilling to disclose how they design their games given that these products involve intellectual property developed from multimillion-dollar investments" (D. L. King and Delfabbro 2019). This latter point suggests that loot box use is becoming more sophisticated as data analytics is increasingly used to withhold or promote offers and features of items available to purchase (D. L. King et al, 2019). Some have argued that in light of these revelations, the video games industry should be subjected to consumer protection measures (Xiao 2020).

Scale and scope of the market for loot boxes and microtransactions

Analytical models of in-game behaviour consider retention and defection of users, translated into ranking of individual games according to daily and monthly active users (Kaneko et al, 2018). In 2020, there are 2.8 billion gamers globally, generating revenues of $189.3 billion from the top five companies (Tencent, Sony, Microsoft, Apple, Activision Blizzard), accounting for 43% of global games revenues (Wijman 2020b; Newzoo 2020). Mobile gaming on smartphones and tablets (split 80%/20%) is the largest segment of the market, producing 45% of the revenue. Mobile revenues include paid downloads, in-game spending on all stores, including third-party providers. In the UK, the total games market revenue was $5.1 billion (McDonald 2019), defined as the amount generated from consumers in the UK.

These figures should be treated with a degree of caution and give a general overview rather than authoritative evidence. Given the increasing use of loot boxes to generate revenue, it could be argued that they represent an increasing proportion of the sales revenue generated by the industry as a whole. As one of the fastest-growing entertainment sectors, estimates of sales revenue from video games vary from $130 billion in 2018 to $174.9 billion in 2020 (Wijman 2020a).

The literature is unanimous in its conviction that loot boxes and microtransactions are highly lucrative (McCaffrey 2019). In 2017, Activision Blizzard declared a $4 billion revenue from microtransactions (D. L. King and Delfabbro 2018). Many authors rely on the Juniper Research Report of 2018, that estimates total spend on loot boxes and skins in 2018 to be $30 billion, forecasting that it could reach $50 billion by 2022 (Juniper Research 2018). While these figures are extensively cited, there is also evidence that the cost of games development is rapidly rising with longer development times and high technological requirements (Schwiddessen and Karius 2018). It would be beneficial if research generates evidence to increase our understanding on the share that loot boxes and microtransactions represent on global revenues. In our sample, the majority of publications rely on self reported or consultancy generated reports that lack transparency about their data.

We can only estimate the scale of microtransactions. Accurate data is not available. Loot boxes are poorly defined and a sub-set of the microtransactions that occur in video games (Kao 2020). Microtransactions are in effect a business model in which players purchase virtual goods that may be extra game content, virtual currencies to use within the game and items that enhance the user experience (Kao 2020). While previous comments on the lack of market information on loot boxes are pertinent to business models, there is some evidence that microtransactions using loot boxes have proliferated to the extent that other monetisation methods such as subscriptions are more rarely seen (Xiao 2020a).

Monetisation and user retention

Gaming is only one of many technology-intensive industries in which innovation drives experimentation with alternative business models, which in turn creates legal and

regulatory grey areas around the customer's experience (McCaffrey 2019). In a somewhat lateral approach, however, van Roessel and Švelch (2021) argue that expertise in monetisation has become a core (and accepted) element of game design and in larger studios such as Electronic Arts and Ubisoft, there are specialised job roles in monetisation. Data analytics' growth as a revenue stream from what is otherwise "free to play" games further complicates the market analysis. For example, "players' connections to their social media profiles and larger social networks allow for targeted advertising and other interventions, such as predictions on how to alter the game to "convert" free players into paying players, leading to new revenue opportunities." (Whitson and French 2021, 10). Monetising strategies in gaming are not only connected to players' investment in, for example, loot boxes, but also involve selling information about players and their non-game activities on social networks. These roles are not exclusively related with loot boxes, but they do emphasise the complexity of monetisation within the industry.

There are many different approaches to monetising video games and unlike other goods, the revenue generating model cannot be analysed separately from the design of the product itself. Within the life cycle of the production of a video game, one of the critical design features that has to be clarified relatively early is the monetisation model. This varies in ways that other creative industries (say, cinema) do not. Usually, the design philosophy that determines the type of the game (and its intended audience) and the chosen business model (or models) have to be synchronized to maximize the engagement and retention of the end product (potentially maximizing profit).

Crudely, the market divides between a "buy-to-play" model and a "free-to-play" model (although see below for how this has been complicated). In a study that specifically asked which business models and genres were associated with the increased opening of loot boxes, Macey and Hamari (2019a) found that "the particular business model employed by game developers has more overall effect than the genre of the game".

Loot boxes have increased in scale in line with with "freemium" model of distribution. This model is built round microtransactions as a revenue stream that some argue shifts the underlying business from a product to a service model (Zanescu, French, and Lajeunesse

2020). The basic model suggests that the game is downloaded from digital platforms such as App Store, Google Play, or Steam, with most players spending no money at all to play the game. Still, players are encouraged "to spend money to make unimpeded progress in the game" (D. L. King and Delfabbro 2019). Loot boxes are inserted into freemium games as a mechanism for in-app purchases. Even if players do not wish to access loot boxes, they cannot avoid exposure to these features of the game. They will constantly be reminded of the opportunity to avail themselves of the random rewards contained in loot boxes.

These purchases resemble arcade machines where the unit price for each transaction is small, but repeated purchases can quickly stack up expenditure. D. L. King and Delfabbro (2019) label these schemes as predatory, given that they *"disguise or withhold the true long-term cost of the activity until players are already financially and psychologically committed"*. There is no limit imposed on player spend, placing the responsibility on the player to control purchases. Items may, however, also be bought with virtual currencies or in-game rewards, particular to each game. These items are never assigned a monetary value, only acquiring one in an online marketplace such as Steam, where players set the value of virtual goods *"based on supposedly free market considerations"* (Zanescu, French, and Lajeunesse 2020). Aside from these microtransactions, the freemium model introduces additional valuation metrics to games that are familiar in other creative industries where the popularity of, for example, a film is determined not by the cost of its production, rather by the audience reaction and number of viewers. Player numbers and player retention metrics enter the evaluation of games as a competitive market strategy and as loot boxes become normalised in games, players increasingly expect them to appear.

Calls for ethical game design

Reflecting on these issues, D. L. King and Delfabbro (2019) suggest ethical game design principles are required in the industry, whether imposed by regulation or adopted voluntarily by studios. These ethical principles are preferable to measures that may regulate current microtransactions but will not be future-proof for other related schemes to emerge. There is precedent within the video games sector to self-regulate when faced with negative publicity about violence in games in the 1990s (McCaffrey 2019). However, loot boxes are not exclusive to the freemium model; the spread of monetisation techniques into pay to

play games hides the true cost of these games, so that the initial purchase may be the beginning of an ongoing financial investment (Macey and Hamari 2020). The primary example of this model is *Battlefront II*, developed by Electronic Arts and launched in 2017. A large portion of the game content (e.g., characters, cosmetics, upgrades) was hidden behind a paywall and the game became controversial as players realised that those willing to pay were seen to have an advantage. In response to widespread criticism, EA first reduced loot boxes' prices, ultimately disabling them altogether before the official launch (Perks 2020).

The study of loot boxes demonstrates the complexity of market arrangements in the video games sector, particularly regarding regulation. Developers and publishers use these mechanisms to encourage players' retention and optimise the player experience. The literature that has been gathered on the economy of games is mainly critical of this practice, noting potential exploitation of player data so that conditions of the game (e.g. price, availability) are manipulated to take advantage of personal information (e.g. financial status) that in turn determines presentation of loot boxes to players. There is often limited disclosure or misrepresentation of the game conditions, including the value or utility of items in the boxes or that data analytics have been used. Offers to purchase items can be time-gated (e.g., available only on a specific date or for a certain length of time) to manipulate player behaviour (Xiao 2020). While there have been limited attempts in the industry to self-regulate as a response to media and criticism from within the industry, these have not addressed the mechanism itself, instead offering to make buying and opening of loot boxes more transparent to players.

Overall Assessment of Market Analysis Evidence

- Loot boxes definitions heavily oriented towards **moral and ethical consequences** of their implementation in games dynamics
- RRMs are categorised in 4 different ways, but gambling seems to fit only one category (Embedded-Embedded RRM). However, this does not exclude the potential harmful nature of other categories particularly when third-parties may enable cashing out of RRMs beyond the intentions of the developer. This raises questions

about **boundaries regarding loot box mechanics** that are harmful and might need some regulation.

- Relationships between loot boxes and game companies' attempts to increase market share and user retention need to be established longitudinally. We know that companies have added or removed loot boxes to games, but more research is required to conceptualise and analyse why, and to account for results of such action.

- Misrepresentation of virtual currencies potentially influences gamers to spend more acquiring loot boxes. **Transparency mechanisms for virtual goods acquisition** (e.g., show conversion rate between real and virtual currency; set spending limits; inclusion of verification steps before completing purchases) could be a way to maximise consumer protection.

- There is a need for the gaming industry to provide insight to government into the scale and nature of revenues derived from UK-based gamers purchasing loot boxes – along with insight on the distribution of spend and how this is changing.

Rapid Assessment 2: Drivers of Problematic Play

Methodology

As use of loot boxes has increased within digital games, concerns have been raised about their potential to generate harm. Much debate has focused on whether "loot boxes" are akin to gambling or not, given their reliance on randomised reward structures. However, these are not the only harms that could be associated with loot boxes.

This takes place against a background of significant concern around youth and loot boxes. Two recent surveys studied young people's perceptions of loot boxes. Both focused on British-based samples. The Royal Society for Public Health surveyed 1100 young people aged between 11 and 24 and found that 79% of this group considered loot boxes themselves to be addictive. Focus group data showed that young people also considered gambling-like activity to be an increasing part of their everyday lives (RSPH, 2019). A further study by Parent Zone of 1001 children aged 10-16 reported similar results, with 76% of children feeling that online video games try to make you spend as much money as possible. Focus group evidence also revealed children's unease about the loops in loot box designs, with participants noting "people get addicted to them, they keep buying and buying…". One participant also described how loot boxes and the mechanics of certain games could generate harms:

> *"In some games there's like a loot box culture where everybody buys loot boxes and once you buy one, someone's bought more loot boxes than you and has got more stuff comes and wipes out everything that you bought from the initial loot box, so you end up feeling really depressed because you spent a load of money and then lost it all."* (ParentZone, 2019).

These findings are replicated by Wardle (forthcoming) who conducted a series of focus groups among British school-children aged 14-17. This flags the need for sustained research.

In light of this and with particular attentiveness to UK and youth contexts, DCMS tasked us with assessing the existing empirical evidence exploring what types of problematic play might be associated with loot boxes, and what the drivers of potential problematic play

might be. For this review, we adopted a broad view of harm, focusing on any adverse consequence that might arise from use of loot boxes.

The search strategy was crafted with best practice for rapid reviews in mind and in consultation with librarians who offered subject-matter expertise. Exploratory searches in the academic databases and using tools such as *www.citationgecko.com* confirmed that the term 'loot box', 'loot crate' and 'gacha' (and similar terms drawn from industry) was specific enough to retrieve a set of papers that were within scope for the rapid review protocol (see Annex C for the agreed review protocol).

Including items such as 'harm' or 'problematic' within the search terms was considered but it was agreed that this would require over-specification of *types* of harm. It was necessary to make sure that we would identify and include any paper that focused on the relationship between loot box use and any type of harm (this could be financial, inter-personal, health etc). Instead papers were retrieved and abstracts searched to identify those that related to any detrimental experience or problematic play.

The searches were conducted with the SCOPUS and Web of Science databases. The full search string for SCOPUS is available in Annex C. The SCOPUS search was conducted first. Abstracts were reviewed by two members of the research team independently, with queries about shortlisting discussed. The Web of Science search was conducted by one team member only, though yielded few additional papers. Relevant papers were selected for full text analysis on the basis of being **empirical studies of potential harms associated with loot boxes**. This meant that potentially interesting theoretical, qualitative or unpublished work, along with empirical studies of loot boxes that did not relate to harms, was out of scope. However, the focused nature of this search is complemented by the findings from the Market Analysis work stream, which paints with a broader brush. The searches were conducted in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) (see Figure 2 for the PRISMA flowchart).

Data extraction tables were constructed for full-text analysis of the final tally of papers. In addition to standard bibliographic information, studies that made it through the first round

were assessed for: Objectives, Country/region, Method, Population (general, age-group), Loot box type(s) studied, Links to gambling, Recruitment method, Sampling type, Analysis type, Measures used, Dependent variable, Overall findings - gambling outcomes, Overall findings - other health/harms. After this information was extracted final determinations were made as to the overall Quality Assessment and Limitations of each study.

Problematic Play

Round 1: Search

Scopus	Web of Science
n=115	n=89

Total Round 1: n=204

Round 2: Duplicates removed, Title/Abstract/Keyword screening

Excluded based on relevance
n=160

Duplicates removed
n=18

Total Round 2: n=26

Round 3: Full-text analysis

Excluded based on relevance
n=4

**Total Studies included: n=22**
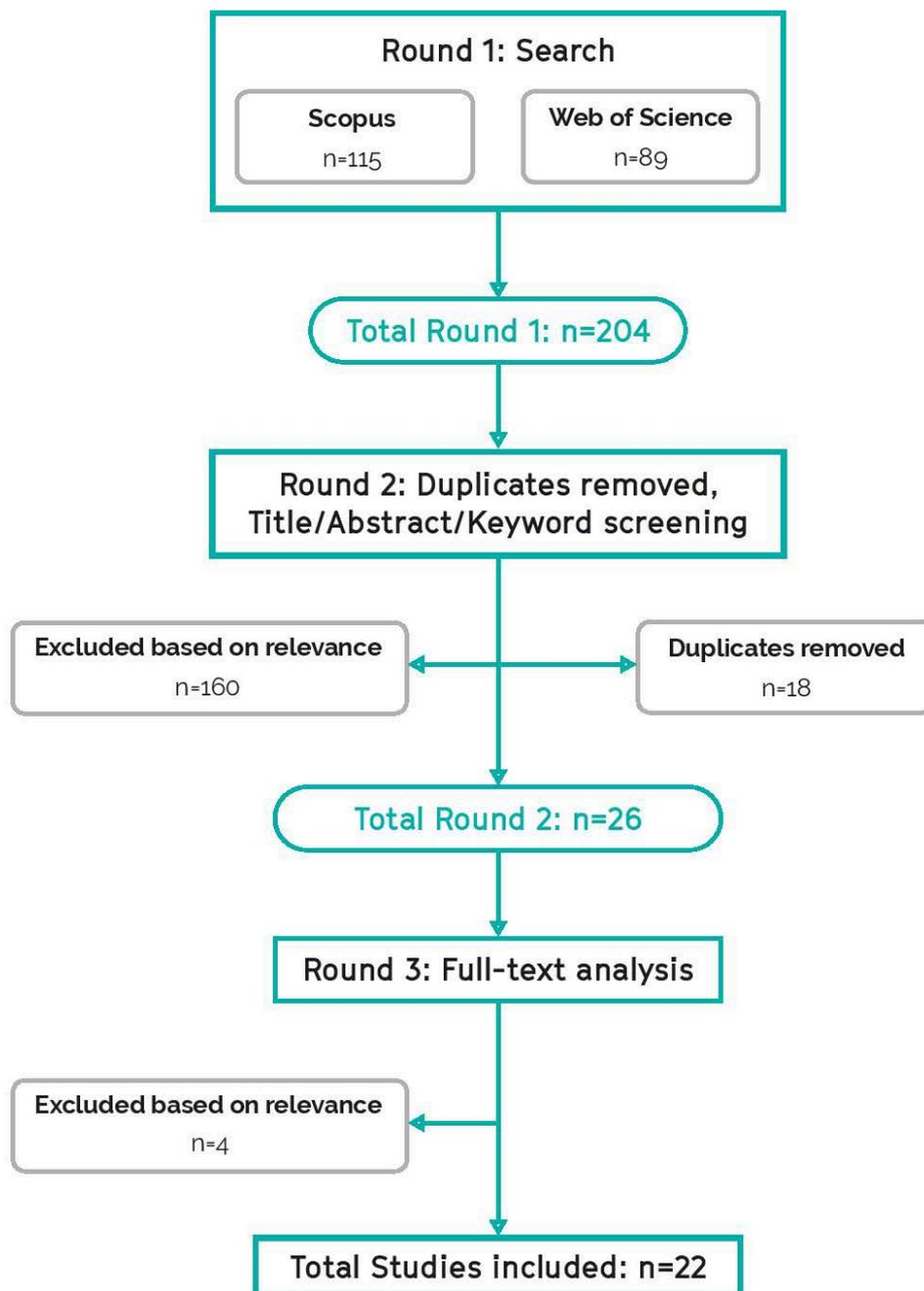
Table 3: Problematic Play PRISMA

Results

Gambling-related studies have been the mainline - and almost exclusive - area in which literature was found linking loot boxes with potential harms and problematic play. Some key works in this literature are strongly critical of loot boxes - often on the grounds of finding correlations between loot box usage and certain measures of problem gambling. One influential way of putting this has been the assertion that 'loot boxes are psychologically akin to gambling' (Drummond & Sauer 2018).

First, we look at review papers which have collated evidence from different studies, before moving onto to present findings from individual studies.

Secondary and review papers

Our review identified two studies which sought to examine the broader evidence between loot boxes and aspects of problematic play. The first was a secondary analysis of six existing datasets looking at the relationship between loot boxes and problem gambling (Close et al, 2021). The second is a review by Delfabbro and King (2020) of existing evidence on the 'gateway hypothesis' that loot boxes encourage other forms of gambling. These are valuable papers to begin with, as they share many of the goals of this Rapid Evidence Assessment. In drawing together existing work, they help to frame the existing state of knowledge on loot boxes and problematic play.

Close et al, 2021 draw on publicly-available data from studies on loot box spend and problem gambling including (Zendle and Cairns 2018), (Zendle et al, 2019), (Zendle 2019), (Drummond et al 2020), (Zendle and Cairns 2019) (Zendle et al, 2020). Close et al, themselves note that the samples across these data sets are diverse: some are gathered via internet surveys, by recruitment through game forums, Reddit or the Mechanical Turk microwork platform to assign tasks. These methods of collecting the sample may have issues in terms of representativeness (i.e., if they are composed in ways that reflect wider social or national groups). There are also issues with the comparability of loot box spends: some studies allowed respondents to input values, while others had categories pre-

registered. This can lead to issues when comparing studies, and issues with the validity of self-reported data.

Nonetheless, Close et al (2021) were able to replicate the core findings from each individual study and synthesise between them to show a moderate strength correlation between loot box expenditure and problem gambling score (Spearman's Rho = 0.33). They also highlighted that disproportionate expenditure on loot boxes was generated from a minority of the sample: the top 5% of spenders generated half of the expenditure on loot boxes, with no evidence that this 5% had greater incomes than others. They argue that game developers may be generating outsized loot box profits from at-risk individual (either those experiencing problem gambling or problem gaming). However, they do not present estimates on what proportion of the top 5% of loot box spenders were classified as experiencing gambling problems. This seems an omission which would further support their claims.

Delfabbro and King (2020) explore the 'gambling-gaming convergence' through examining three sets of literature including studies of loot boxes. The authors conducted a Scopus search using 'gambling' AND 'video-gam*'. A total of 30 papers were evaluated (period 1995–2020) with 18 specifically having relevance because they examined the relationship between gambling and video-gaming. The authors report little evidence to support the view that loot-boxes encourage gambling or facilitate an entry point into other types of gambling, including those associated with gaming (e.g. esports betting). Overall, this review found little convincing evidence in support of the 'gateway hypothesis', and offered an alternate view:

> *"Although recent research suggests that loot boxes may be more appealing to problem gamblers, there does not appear to be much evidence of a migration from loot-box spending to gambling. Instead, the more likely pattern is that gamblers spend more on loot boxes because they entail elements of chance and risk-taking that appeal to them. In this sense, loot boxes could be seen, not so much as a gateway to gambling from video-games, but as an additional source of expenditure for gamblers."* (pp.386-387)

Whilst this alternative explanation may be plausible (and can and should be tested), it is also wise to exercise caution about the difficulty of establishing such sequences in the absence of robust longitudinal data, and to recognise the emerging status of inquiry. Absence of evidence is not necessarily evidence of absence.

Individual studies: Loot boxes expenditure and problem gambling

Fifteen studies from our search directly examined the relationship between loot box purchasing and problematic gambling behaviours, with most using the Problem Gambling Severity Index (PGSI) or the South Oaks Gambling Screen Revised for Adolescents. Eleven studies focusing on adults aged 18 and over found a correlation between loot box expenditure and problem gambling. For example, Zendle et al (2020) found a positive correlation between loot box expenditure and mean PGSI scores, with mean PGSI score (indicating greater risk of gambling problems) being higher among those who paid money to open loot boxes than those who did not. Drummond et al (2020) found similar results, with those classified as experiencing problem gambling according to the PGSI reporting higher mean spend on loot boxes. These findings have been replicated in other studies, giving greater confidence in results (Close et al, 2021).

A further four studies focused on young people (those under the age of 24) and also found a correlation between loot box spend and problem gambling. Three of these presented empirical data, with Wardle & Zendle (2020) noting that British loot box purchasers aged 16-24 were 4.4 times more likely to experience problem gambling than non-loot box purchasers, even after impulsivity and other gambling behaviours were taken into account. Kristiansen & Severin's (2020) study of Danish gamers aged 12-16 found that those who either sold loot boxes or bought loot boxes for money had higher rates of experiencing problem or at-risk gambling. Kristiansen & Severin (2020) additionally noted that loot box transactors (buying and selling) were also more likely to gamble on other things, a finding corroborated by Wardle & Zendle (2020). Zendle et al's (2019) study of 16-18 year olds concluded that "*individuals who had spent money on loot boxes within the previous month were measured as having over twice as high problem gambling severity ratings as those who had not*". Delfabbro and King's (2020) review of the gaming-gambling gateway theory concluded that "*video gamers who are high risk gamblers are attracted to loot boxes*" and

that "(*young) people engage in both gambling and video-gaming, but there is not strong evidence that engagement in one activity consistently co-varies with the other*".

Only two of the studies reviewed were based on evidence generated by all British participants: Wardle & Zendle (2020) and Zendle (2020). Both found that loot box purchasing was as popular as engaging in many other forms of gambling and evidence of positive relationship between loot box spend and problematic gambling.

Some studies extended their analysis to look at the relationship between varying frequency of purchase of loot boxes or varying spend and problematic gambling. Four studies reviewed directly discussed this. They typically found evidence of a dose/response relationship, by which as spend on loot boxes increased (or in the case of Zendle (2020), frequency of spend on loot boxes increased), problem gambling severity increased. For example, Close et al (2021) found that mean PGSI scores increased as loot box expenditure increased. This was replicated in Hall et al (2020) and Drummond et al (2020). Zendle (2020) also noted a dose/response relationship in relation to the amount of money made from selling loot boxes and problem gambling severity, the latter increasing as the amount of money made increased.

Whilst many authors noted that other factors could account for the correlations observed, only two studies identified attempted to account for a range of other factors that could underlie these results: Wardle & Zendle's (2020) analysis of young people aged 16-24 living in Britain and Von Meduna et al's (2020) analysis of gamers in Germany. Wardle & Zendle's analysis took into account socio-demographic/economic factors, impulsivity and the broader gambling behaviours of young people. They found that the relationship between loot box purchase and problem gambling attenuated but remained significant when adjusting for these other factors, noting the relationship was of similar magnitude to the association observed for online casino/slot gambling and problem gambling. Von Meduna et al (2020), by contrast, found that the relationship between loot box purchase and problem gambling was no longer significant when broader gambling behaviours were taken into account.

Loot Boxes and digital gaming: A rapid evidence assessment

Individual studies: "Risky Loot Box use", problem gambling and loot box spend

The Risky Loot Box Index was developed by Brookes and Clarke (2019) and aims to capture problematic aspects of loot box use. This included excitement leading to more purchases; playing for longer to earn more loot boxes; not fulfilling other activities to earn more loot boxes; feeling compelled to open another loot box when playing and chasing valuable items. Brookes and Clarke tested this instrument in two studies, generally finding that Risky Loot Box Use was associated with problem gambling. This instrument was used in two other studies identified in this review. One found that Risky Loot Box use was positively correlated with increased loot box expenditure, problem gambling and Internet Gaming Disorder (Drummond et al, 2020). The other study looked at whether Risky Loot Box Use varied according to Covid-19 concerns, finding greater Risky Loot box Use scores among those with higher contamination concerns (Hall et al, 2021). Like Brookes and Clarke, Drummond et al (2020) concluded that Risky Loot Box Use, Problem Gambling and Internet Gaming Disorder were and should be empirically related as they represent facets of impulse control problems.

Finally, King et al (2020) adapted the Risky Loot Box index to capture broader engagement in all forms of microtransactions, not just loot boxes alone, finding that participants with higher severity levels of either gambling disorder or gaming disorder demonstrated a greater likelihood of purchasing microtransactions.

Individual studies: Loot boxes and other harms

As is common in many social scientific studies, variables are often treated in isolation rather than in a more holistic manner. When considering the use of loot boxes in games, the focus on microtransactions can skew the focus to gambling behaviour to the exclusion of other potential harms. Nine of the studies reviewed included focus on harms beyond gambling behaviours, of which four focused on younger people (Shibuya et al, 2019; de Camp, 2020; King et al, 2020; Ide et al, 2020). The other harms considered included: high risk/excessive gaming or problematic gaming; psychological distress, including anxiety or depression. One study examined the relationship with other substance use (King et al, 2020). Interestingly, no studies were identified that examined broader harms such as financial difficulties.

Loot Boxes and digital gaming: A rapid evidence assessment

Problem gaming was one area explored in our sample. Five studies found a positive association between problem gaming (variously defined) and the use of loot boxes. Ide et al (2021) found that those purchase loot boxes were significantly more likely to exhibit online problem gaming, with Von Meduna et al (2020) noting similar results. Some studies specifically considered how these other potential harms may covary with the association with problem gambling.

For example, A. King et al (2020) in a study involving 18 -25 year olds, found that microtransactions (not just loot boxes) were a major mediator of internet gaming disorder and gambling disorder, and also in displaying lower aversion to risk-taking behaviours. That said, they also concluded that participants experiencing greater severity of either problem gambling or problem gaming were more likely to purchase mictrotransactions.

Drummond et al (2020) also found that the relationship between problem gambling and loot box use was moderated by Internet Gaming Disorder score, but additionally found that participants who experienced both problematic gambling and gaming were more likely to spend more on loot boxes. Li et al (2020), found that loot box purchase was also associated directly with problem video gaming and problem gambling severity as well as increased video game engagement. By contrast, in work by D. King (King et al, 2020) on microtransactions in *Fortnite*, it was found that problematic gaming was associated with trait impulsivity and the perception self-worth would be diminished by reducing hours of play. Notably, however, *Fortnite* loot box spending was not associated with gaming disorder symptoms.

As well as looking at these associations, some studies also examined other harms, like psychological distress, anxiety or depression either alone or in combination with problematic gaming. Results were mixed. De Camp et al (2020) examined loot box use among 13-14 year olds and 16-17 year olds. For both age groups, experience of anxiety or depression was not associated with loot box purchase, though among 16-17 year olds, there was an association with other substance use (tobacco, cannabis). This study also noted that being bullied was associated with loot box purchase among both age groups. Li et al (2020) noted that loot box purchasing may be associated with increased mental distress because of

its association with greater engagement in video games and with problematic gaming and gambling.

Cultural factors may also be influential as is indicated by a study by Drummond et al (2020) who found that Aotearoa New Zealanders also showed a larger association between loot box spending and psychological distress compared with those from Australia and the United States.

Biegun et al, (2019) in a study involving Canadian undergraduate students found that while instruments used to measure anxiety, depression, and stress were significantly related to problem video gaming, these associations no longer held when other factors such as social alienation and gaming motivations were taken into account and controlled for. However, the authors of this study make an interesting point:

> *"Gambling researchers have pointed to the role escape plays in alleviating feelings associated with mood disorders, and while mood disorders were not as prevalent a predictor of problematic video game play in this study, there are potentially classes of gamers who play video games for similar reasons. Similarly, other gaming motivations that overlap with gambling motivations, such as coping, competition, and recreation, positively predicted problem video gaming. "* (p.16)

They go on to suggest that "future research should explore whether these motivations for online video gaming may contribute to the development of future problem gambling" (p. 16). We would concur with this point and would suggest that given that there may be potential classes of players who are predisposed to engage with loot boxes in way that is associated with psychological disorders.

Overall view and issues

Whilst the evidence base looking at the relationship between loot box use and gambling outcomes is developing, most of the studies conducted to date have reported similar findings: that there is a significant association between loot box expenditure and problematic gambling. These patterns have been repeated by different research teams, in different studies, working on different populations and results from six of these studies

independently verified by Close et al (2021) through replication of the original findings. All of this supports the consistency of this finding.

Emerging evidence of a dose/response relationship is also notable. According to epidemiological theory (Lucas and McMichael 2005) if this relationship is causal in nature, one would expect to see greater engagement in loot boxes (measured through increased frequency or spend) be correlated with greater problem gambling severity. Studies examining this to date find evidence supporting this.

The evidence base on broader harms associated with loot boxes is scant, with very few studies examining a wider range of adverse consequences associated with loot box purchase. Most such studies have focused on the association with problematic gaming, with most finding evidence of an association between loot box purchase and problematic gaming. Some have examined the way problematic gaming and gambling covary, moderating and mediating this relationship, but also noted that these are conceptually similar constructs which may reflect other commonalities: impulsivity is one explanation that has been offered, along with potential maladaptive use of these products for escape suggesting that, for some, that loot box use may be a symptom of broader issues.

A few cautionary notes need to be taken into account when reviewing these results, most of which are noted by the individual authors. Scientific studies can make use of a range of methods, all of which have potential benefits (explanatory power, timeliness, sample size) and limitations (cost, estates, working assumptions, staffing and equipment requirements). Sometimes, these complexities are glossed over when findings are picked up in wider contexts, but it is important to dig down into the detail of what was done and what has been shown.

The studies included in this sample are cross-sectional and correlational. We do not know from the literature the directionality or causality of the relation observed between loot box spend and problem gambling, or indeed that a causal relationship exists - it is plausible that another set of relationships or behaviours may be driving this association (the 'third variable' effect).

To date, the evidence base has concentrated on establishing the stability and consistency of the correlational analysis. Whilst it is positive that this evidence base exists, and that findings can and are being replicated, there is a need for studies to examine alternative explanations. For example, if people who spend more money on loot boxes also tend to gamble on other things (which some studies suggest is the case) but participant's broader gambling repertoire is not captured by researchers, it may be their engagement in other forms of gambling that is actually driving this association rather than the loot box purchase itself. Furthermore, there is a range of gaming actions, like skin betting or the selling of loot boxes, which could also underpin this, if those purchasing loot boxes are also disproportionately likely to engage in these activities.

To date, most of the studies included in this review have not captured data on broader gambling or gaming behaviour and thus have not been able to test these hypotheses. Most have simply asked people how much they spent on loot boxes and then administered the Problem Gambling Severity Index (PGSI). The PGSI is designed to be administered to those who have gambled in the last 12 months and typically requires some assessment of broader gambling behaviours prior to administration. Yet most studies haven't included these wider questions raising questions about the validity of this instrument under these circumstances. That said, an evidence base which looks at alternative explanations and examines their potential contribution to this association is starting to emerge: two studies have sought to examine whether the association is explained by broader gambling behaviours, with mixed results, and researchers increasingly recognise the common aetiological basis of some of the measures being correlated (Drummond et al, 2020).

All studies reviewed assessing the relationship between loot boxes, problem gambling and other harms relied on self-report within surveys. Whilst self-reported survey data forms the backbone of many health and social policies, there is a need to develop valid measures. To date, there appears to have been little methodological validation of the measures used to capture loot box engagement (either frequency or expenditure). It also is unknown how well self-reported measures of loot box spend correlates with transactional data. Establishing

this would require access to industry data, though a validation study comparing aggregate reports with daily diary entries would be a reasonable starting point.

Another issue with this literature is that nearly all studies included use non-probability samples, with attendant issues for generalisability. The quality of non-probability studies varies. Many of the studies recruit from university undergraduates, online forums such as Reddit, or microwork platforms like Amazon Mechanical Turk (AMT). This can introduce mischievous, bad faith or other low-reliability respondents, as can be seen in studies (eg. Macey 2020) where large numbers of participants had to be removed from the sample. However, reviews of online panel samples show that whilst they should not be used to measure and monitor the prevalence of behaviours, they tend to produce similar conclusions to probability methods when focusing on relationship between variables or multi-variate analyses.

Studies have tended to focus on adult cohorts. This is understandable as there are additional legal, ethical and methodological concerns with studying children and youth; adult studies are generally more feasible and efficient to conduct. An emerging set of studies (de Camp 2021; Kristiansen and Severin 2020; Wardle and Zendle 2020; Zendle et al 2019) have built initial understanding of loot box usage among younger players. Findings from these studies are consistent, replicating associations observed among adults.

Additionally, the set of games and game communities represented is often undefined. Where it has been defined, the studies have tended to favour games by major publishers such as Epic (Fortnite), Activision-Blizzard (Overwatch), and EA (Fifa series). Games by smaller publishers and mobile developers are under-represented (although see Zendle et al 2020), and more specific studies that analyse specific games (eg. King et al 2020) are needed. Relatedly, there have been few attempts to assess in what ways different types of loot boxes, within different sort of game context, with different levels of control by game designers may be related to different harmful outcomes. In short, are there particular product designs, implementations and gaming contexts that are more associated with harms than others?

Conclusion

In concluding this assessment of the evidence on loot boxes, we will first outline our *rapid assessment findings* drawing together the set of papers read through the Market Analysis and Problematic Play searches. Then, in outlining our *recommendations* we will draw on a limited set of resources beyond the systematically gathered material (including our Expert interviews and 'grey' literature) in order to further contextualise the findings.

Rapid Assessment Findings

In our view, scholarship on loot boxes is nascent. We found a relatively small set of studies, and there is a need for more work in this area. However, the literature does give us a developing picture, particularly when the two academic workflows are combined.

Our **Market Analysis** search returned papers from a range of disciplines (several of which also appeared in the Problematic Play search). Many of these papers were critical of the ethics of loot boxes. Empirical studies on the loot box market are lacking, and this reflects general difficulties in pulling out one element of the gaming market for specific analysis (particularly one as poorly defined as loot boxes). While loot boxes are a relatively recent addition to digital games, they can be considered a particular subset of 'random reward mechanics' that have increased in prominence in digital games along with mobile, online and social features, data analytics, and the free-to-play business model – although they also appear in full-price games.

From a business point of view, the main rationale behind loot boxes may not be direct profits or monetisation *per se*, but 'user retention': ongoing engagement from a player base which both generates revenue, encourages repeat engagement, and enables forward planning. In our expert interviews, this point was emphasised: game developers care about their craft and their communities, but game development can, like many creative industries, be highly risky. Loot boxes should be contextualised in light of wider tendencies in digital culture that have been termed the 'platformisation of cultural production' (Nieborg and Powell 2018). In this light, scholars have criticised technologies which "casualize risk and normalize uncertainty" (Ross and Nieborg 2021, see also Xiao 2020).

Precise definitions and categorisations of loot boxes are lacking, reflecting their complexity, diversity and ongoing development. One influential typology (Nielsen and Grabarczyk 2019) defines four types of RRMs depending on whether aspects are 'isolated' within the game, or 'embedded' in the real-world economy. Nielsen and Grabarczyk argue that only one of these four types constitutes gambling. This position has been critiqued by Xiao (2020), who argues that three of the four types of RRM potentially constitute gambling if we expand our lens beyond the immediate loot box event and take into account third-party sites, internet of things toys and wider platform dynamics. The main point of contention is whether or not random rewards can be 'cashed out' for real-world currency, and whether third-parties that may facilitate cashing out are included in the analysis. Overall, even where it differs on specifics, this scholarship tends to insist on the complexity of loot boxes, and the importance of considering them in their social and economic context.

Our search strategy for **Drivers of Problematic Play** was more focused, only admitting empirical studies of loot boxes and potential harms. We found that the major focus of this literature has been to investigate loot boxes in relation to problem gambling (other potential harms have received far less research attention). This set of studies showed a pattern correlating measures of loot box spending or usage with problem gambling (largely measured by the Problem Gambling Severity Index).

These correlations were observed across multiple populations. Replication studies are beginning to emerge that add confidence that problem gambling is associated with loot boxes in a small minority of players, and likewise the association with other psychological harms. While these associations do not seem to hold for the majority of game players in their usage of loot boxes there is also the issue of the normalisation of gambling-like behaviour (particularly as regards children) which echoes theoretical and contextual concerns in the Market Analysis workflow. These twin issues, (i) the sub-group of players who are spending well out of proportion to others and, (ii) the normalisation of gambling like behaviour are worth consideration by DCMS for a proportionate response.

In this consideration, the Problematic Play literature must be properly contextualised – particularly when considering its meaning for the UK. There are methodological issues with many of these studies, most prominent being that they are correlational and causality or directionality cannot be inferred. From our set of papers it is also not possible to rule out a third variable that may explain the correlation (although publications examining this are beginning to emerge). The studies often do not differentiate specific games or loot box implementations, tend to utilise non-representative or low quality samples from microwork platforms or internet forums, and employ measures not developed for the context of online digital gaming (raising questions of their validity).

To date the Problematic Play studies have tended to do what the Market Analysis literature warns against: abstract loot boxes from their context. When asked about 'loot boxes', many of the respondents to these studies may have had a range of specifics – different games, different communities, different backgrounds – in mind. At present it is difficult to disaggregate which loot box implementations may be particularly problematic; to identify which populations may be particularly at risk of problem gambling (or other harms) when they engage with loot boxes; or to rule out covarying factors that may be difficult to untangle.

As such, even though they are focused in nature (which is often the case when initially identifying an area or relation that merits sustained study), the Problematic Play set of studies are now pushing out to try to contextualise loot boxes more effectively. On the other hand, the Market Analysis literature will benefit from more empirical work to test conceptual and contextual analyses and theories. Additional studies of how and why games companies introduce or remove loot boxes from their games, reliable market data, accounts of third-party exchanges, player motivation, the role of social media and influencers, and critical views on data analytics use in the games industry would be valuable in helping to understand loot boxes.

Recommendations

In light of the problems with abstracting loot boxes out of context, we recommend an approach based on **consumer protection** frameworks. Situating this type of gaming behaviour within this wider context allows for a more nuanced approach that recognises that for some groups of players loot box usage is unproblematic from a gambling perspective, while for others it may covary with other problematic gaming behaviour based on particular vulnerabilities. Such an approach would remain capable of response to emerging research findings, as well as be able to encompass known concerns that are not well studied in the literature around loot boxes, such as **data protection**. Loot boxes are in many ways a convergence of gaming and gambling (Albarrán-Torres 2018), but they are *also* a convergence of data analytics with strategies of user retention and monetisation that exceed the games industry.

While specific policy recommendations are beyond the scope of this rapid assessment, it is possible to offer some further guidance. Here we will venture judiciously beyond the core sample of the REA while also drawing on our expert interviews (see Annex A) for context.

- Firstly, we note that in recommending a consumer protection approach we have landed in proximity to a cognate study by Cerulli-Harms et al (2020), prepared for the E.U. committee on Internal Market and Consumer Protection (IMCO). The implications of these IMCO recommendations and potential interactions with loot box limitations introduced in Belgium and the Netherlands warrants continued attention. Approaching loot boxes through the lens of consumer protection is also an approach that has been prominent in Japan: "When it comes to the regulation of *gacha* mechanisms in Japan, consumer laws are significantly more important than gambling laws" (Schwiddessen 2018).

- Children are a key case in which regulatory scrutiny around loot boxes should be considered. Our expert interviewees from Beano Studios described how children in their longitudinal market research rarely (if ever) discuss 'loot boxes' as an abstract concept, and instead seek to communicate the specifics of their engagement with particular games. Problem gambling is an evident concern, but beyond gambling

there are further issues such as data protection and the casualisation of risk. We need to know more about what it means for children to be 'retained' as 'users': loot boxes which mediate children's engagement with online gaming will also mediate their exposure to the developing suite of technologies (see Barassi (2020) on children as 'data subjects') that are involved in digital games. More scholarly and high-quality research on how children view, use and are affected by loot boxes and microtransactions, and how these findings relate to other research on children's experiences and outcomes with online technologies (eg. Stoilova et al, 2021) is a priority area. In terms of oversight, this raises the difficult 'top of the funnel' problem of age verification (which is a difficulty shared with wider social technologies and platforms). As Phippen and Brennan (2020) caution in a related context, however, individual technical solutions such as age verification tools are only part of the complex mix of balancing children's freedom and risk in online spaces.

- It is all but inevitable that loot boxes as they currently exist will give rise to new forms of RRM, monetisation and business models within the overall evolving set of game design and development techniques (in our interviews, one developer described game development as 'faddy'). As academic study of loot boxes leads to more effective theorisation and modelling of loot box game mechanics, educational materials should be made available to help developers orient their work away from designs that are found to present unacceptable risks to players. Models that are similar to loot boxes may evince similar concerns and warrant further research.

- In our interviews with game developers, respondents noted that developers of different sizes had different motivations for implementing loot boxes in their games. A small studio using loot boxes with a view to user retention, managing player 'churn' and content delivery presents a meaningfully different scenario to a publicly-traded company introducing loot boxes to a long-running and popular franchise where robust player engagement builds on previous success and larger marketing spend. A platform deriving high-level network effects and economies of scale from an app store is a third case again (for example, such a platform may be able to act

more effectively in relation to third-party sites that enable 'cashing-out' of RRMs that are Isolated by design; a small developer will likely be powerless). Any measures should be mindful of disproportionately affecting smaller game developers, decreasing the diversity of the industry in the UK.

- Platforms and developers will sometimes assert that they are already employing robust measures to combat problematic play, but the effectiveness of such measures needs to be scrutinised and evidenced independently. For their part, academics will often complain that they do not have access to industry data. Such collaboration is uncommon because it presents significant problems (although see Johannes 2020). Industry has concerns about proprietary data and possible overheads of being involved in research, while game telemetry or business intelligence is not designed for academic questions or standards. Nevertheless, the development of Open Science collaborative protocols would benefit all concerned, particularly if they enable longitudinal and empirical study of loot boxes or the framing of standards of compliance for developers. Here government's convening power could be useful to bring academics and game companies to the table. It should also be noted that following lockdown conditions during the COVID-19 pandemic, new ethical and methodological considerations around the validity of existing approaches and data sets obtain, further complicating possible collaboration (see Hall et al 2021).

- Game developers should adopt safety by design and consumer protection principles where possible, and it is worth consideration how government can support studios that wish to transition away from designs that are found to be oriented to excessive risk or potential harms, or that are overly optimised for user-retention (to the exclusion of other concerns). Annex A, our **expert primer**, is oriented to this discussion. Krasilnikov (2020), in a Game Developer's Conference talk, describes the uncertainty in implementing loot boxes as a small developer, and navigating pushback from the game's community and tensions within the development team. Some of our game developer respondents were positively inclined to official guidance as this would help to orient ethical game design, ensure player protection, establish norms for online game communities, and de-risk development.

Some suggestions for future design norms could include:

1. A minimum age informed by science, government and industry should be established for engaging in games involving loot boxes.

2. Games involving loot boxes clearly and unambiguously inform players that loot boxes involving microtransactions are included in the game but are NOT an essential requirement for playing these games. Players may decline to use them without penalty.

3. It should be made clear at the point of purchase that loot box items do not guarantee a direct path to success in a game.

4. It should also be made clear the extent to which the delivery of loot box items is random in nature, and that loot boxes are prominently labelled with content ranges and % chances clearly displayed.

5. Loot box contents, or chances are not pre-determined or targeted based on player behaviour.

6. After a set number of purchases (e.g., after every fourth), players are informed via an on-screen message that this is their fourth, eighth, etc. purchase and that they should pause to consider how much they have spent at that point and if they wish to continue.

7. Players are informed via an on-screen message when sudden spikes in spending activity occur, encouraging them to pause to consider if they wish to continue.

8. Players should be advised to take regular breaks and that this message appears on screen after each hour (or appropriate session length) of play.

9. Developers and publishers should operate generous refund policies (e.g. all spend for the last *n* days), and players have a clear path to obtain this and to self-exclude.

10. Developers should allow access to a tally of recent spend in the user's profile to allow players to make more informed decisions about their spending.

11. Players should be able to view estimated average spend amounts to level up or max out a character (or similar upgradable item), in order to make better value judgements and manage expectations.

12. Games companies should ensure that their likely first point of contact with players experiencing distress due to loot boxes or other spends are appropriately

trained to offer support and informed as to possible methods for redress/refund. As the precise division of roles varies between studios, key personnel should be identified who can lead on this.

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Annex A: Loot Boxes: An Expert Primer

During the REA, we interviewed several senior developers in the video games industry who have experience of developing games containing loot boxes in the free-to-play mobile space (as well as broader experience in console, flash games, games for social media platforms). These are all developers of 10-20 years' experience, leading teams and products, focused on project management, design, retention, engagement and monetization. The correspondents were: Will Luton, Director, (Department of Play consultancy, previously Rovio, Sega) Jade Sowa, (Product Manager at Slipstream Labs previously Zynga, Relentless) and Patrick McGrath (Studio Head, Ten Square Games Berlin, previously Wooga, Zynga, Popcap). We also interviewed Helenor Gilmour and Pete Maginn, both of whom serve as Directors of Insight at Beano Studios. Beano is a children-focused publisher whose Beano Brains platform has conducted longitudinal market research with young people.

These discussions, along with selected material from professional publications and symposia, inform this Expert Primer that outlines specialist discourse on loot boxes.

Loot Box Design in Context

A deep inward-facing discussion on game development practices exists online, especially in the free-to-play space. Game designers, product managers and product, producers, CEOs and consultants frequently present to their peers at industry conferences and via their blogs (generally freely available to access), deconstructing and comparing each other's successes and failures (often via the lenses of economics, cognitive psychology etc).

Accessing this information allowed us to identify a wide range of intentions and motivations surrounding loot box design and implementation. Additionally, conducting interviews with industry experts allowed us to add to the findings from initial research. More information is available from resources such as GDC (Game Developers Conference), Gamesindustry.biz, Gamasutra.com, Deconstructoroffun.com, Mobilefreetoplay.com, Pgconnects.com)

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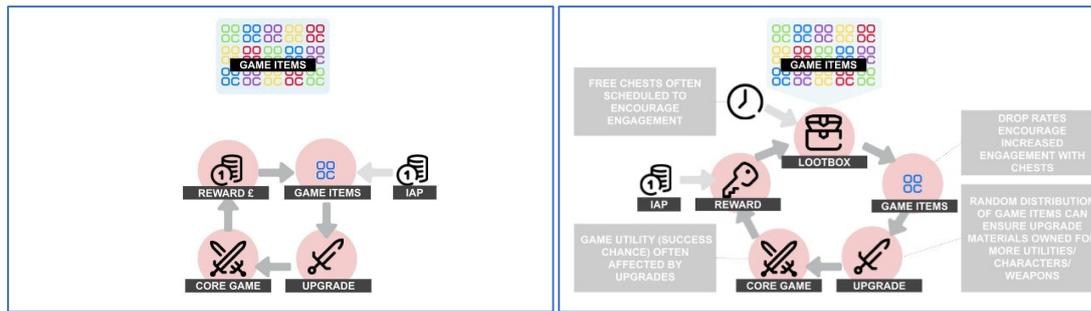
Typical 'traditional' game loop with in-game shop

Typical Game loop using loot boxes

Intentions

Developers cite a variety of motivations for using loot box (or synonymous) systems in their games.

> *"There are lots of things that we consider. It's not just about - for example - revenue or retention or time spent in the game… Always at the forefront of all of this is going to be the experience of the gameplay and the user. That will trump everything else because If it doesn't, then you'll have a rubbish game and players won't play if they deem the game to be unfair. They won't play it. They won't come back, and [with a free game] that's an easy decision for them"* (Jade Sowa)

Notably, developers rarely cite similarity to gambling compulsion loops as a reason for implementing loot boxes in their games.

Excitement

When players receive uncertain rewards (either the item itself, or a strength of item, or number of items within a range), this in itself is accepted to be more exciting than receiving a known reward.

> *"What you're getting is that each time you open [a loot box] there's something new and exciting, so it's much more interesting… it feels very rewarding. Rather than 'you know what you were going to get' which feels like work"* (Will Luton)

Furthermore, opening boxes is often surrounded by a 'ceremony' which – like many other game interactions - feels good to interact with (in industry terms - has good 'game feel') (Hodent 2018); this may be achieved through use of animations, fun sound effects, visual effects.

In our discussion with Beano experts about children's use of loot boxes, both Gilmour and Maginn emphasised that digital games are increasingly important aspects of children's lives and socialisation. Loot boxes are interpreted socially and culturally as well as financially by children. They have tended not to speak of 'loot boxes' so much as specific in-game dynamics and currencies), as an opportunity to socialise, explore identity and engage with figures they admire (such as streamers, fictional characters and sports stars).

Appointments

Retention and engagement are improved by a game giving players a reason to come back (often with something in the game waiting on the player returning). Loot boxes used in appointment mechanics offer a simple, uncertain reward encouraging players to return to the game both to satisfy a curiosity, and in exchange for something desirable.

> *"[Loot boxes are] one way of rewarding players for coming back to your product, engaging with your game. I think the game that we worked on at the time, every time you came back to the product on a separate day (it didn't have to be consecutive) we had a suite of rewards, and those rewards would change to maintain interest in the game"* (Jade Sowa)

Retention

The health of a 'Live Ops' game (the types of games which usually contain loot boxes) is measured by a number of Key Performance Indicator (KPI) metrics. Developers cite the most important KPI in such a game as being Retention (how long players stay in the game on average (McGrath 2021)) since if players fail to retain and stop playing the game completely (also known as 'Churning') they are guaranteed not to spend money in the game ever.

> *"When you look at monetization, this is almost a downstream effect of these other more important things like Retention and Engagement, because you're not going to monetize if [players] don't stick around"* (Patrick McGrath)

> *"When you're making a free to play game, a long term relationship with your players is the key driver of monetization, so you need a game that someone is going to play for weeks and weeks, months and months and not just a couple of days or not just a couple of sessions."* (Levy 2016)

Loot boxes have been seen to improve retention by a number of means including 1) appointment mechanics (unknown daily rewards for returning to the game) and 2) moving desired content further along the player journey and pacing the player's access through the game.

Content Distribution

Breadth

Individual players will likely receive items from loot boxes which have value but had not factored into their current game intentions (e.g. an upgrade for a character they are not currently using). Once the player has won these items they will be more inclined to use them, encouraging a broad exploration of all the areas, characters and content that the game has to offer. For example, without this system, if a player upgrades one character in their game and maxes it out, then a new level in the game requires another character, that player will have a high-friction experience of starting with a new base-level character which is much less powerful. With distribution of items however, a player may find themselves having another character which becomes more powerful than their current character, encouraging exploration of that game content (Telfer 2017b).

Depth

Individual players can receive items from loot boxes which are relevant to future game situations (e.g. a level 1 player receives an item which will become useful at level 5). It's reasonable to expect that a level 1 player would not buy a level 5 item from the shop. Receiving a future-useful item like this from a loot box drop theoretically helps retention by

building intention to use items in future, giving the player more reasons to continue playing the game.

> *"The mechanisms through which you give [game content] (of which loot boxes is one) is really important because you need to pace that out; If you come into a game – as with anyone who's used a cheat code for example – you give them the thing they need or want, the game just becomes boring. It ceases to exist – there's no drive or motivation for you."* (Will Luton)

Content Availability

Democratization of content; low or non-spending players can potentially get access to a game's most powerful or desirable (and therefore most valuable) content without having to purchase that item outright for a high amount. Developers can randomize the acquisition of these items to level the playing field and reduce the extent to which the game is perceived as 'pay to win' (an unpopular prior mechanic where high spending players get guaranteed significant advantages which low spenders do not).

> *"To give the average player the ability to access [a scarce game-changing top level item] from random luck, I think this really gives a little more to the entire player base to have these experiences…*
> *I think this really allows the monetization structure of a game to be more spread out, rather than 'we know that only a certain percentage of our player base can afford this type of stuff', so we will just create essentially a different game for them and everyone else just doesn't get to experience the fun and the excitement of this other game cos they just can't afford it."*
> (Patrick McGrath)

The opposite of the intended effect can also be true, which is that players do not get access to game-critical intended items which are required 'now', due to the semi-random nature of the loot box delivery method. This can increase spend with players where time or social pressure exists in a game:

> *"Children say to us "I've told my mum I need emergency FIFA packs", They talk about it as a critical part of the game; "I [am] in this game with my six friends and I can't participate effectively unless we bulk-buy these packs to try and get the team that I need"* (Helenor Gilmour)

Abstracting Value

Abstracting the actual value of a game object; players may not have an appetite for paying a high value to get an item outright, but they may be more willing to pay a smaller amount several times over for a chance at getting that item. (Katkoff 2017)

Again, this does not work in every game. Interviewee Patrick McGrath points out that with his experience in Hidden Object games (popular among an older demographic, mostly female), players would rather buy items outright than spend the same amount on a loot box guaranteed to contain that item, plus other items (which, rationally is the better deal).

Increased desirability for Sales

Abstraction and sales: when the value of an item is unclear and players are unsure of how many gacha boxes they will need to open to acquire the item (whether that relates to purchase or wait time), they may be more willing to purchase the item outright in a limited sale.

> *"If I'm playing a game and gacha is the main source of getting characters, getting more powerful, but I as a spender really do not like the [random] component, having a bundle come along and say "hey, here's this character for £4.99, or £9.99 or however much you're charging; suddenly, that looks like such a great value because of how random gacha is. But that bundle may not be as valuable if gacha was not there in the first place. Players have to kind of be frustrated by gacha in order to make the sale or the bundle more enticing"* (Witt 2019)

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Influencing Engagement

Events

Events are long periods of play typically aimed at improving engagement. These events often encourage users to engage by offering improved rewards, special 'event chests' or special timed deals on game items (similar to a Black Friday event in non-virtual retail). Events are often themed or tied to real-world events (e.g. Halloween, Olympics). (McGrath 2021)
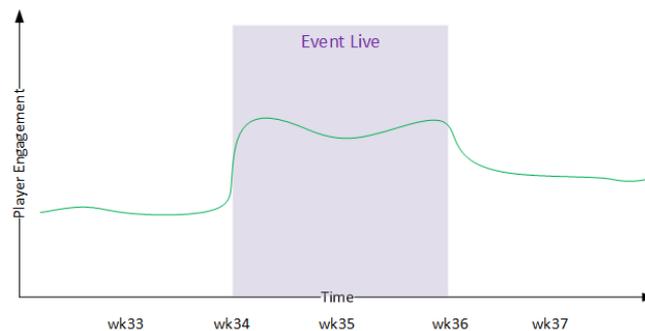

Liquidity

Games with 'pvp' (Player vs Player) multiplayer components benefit from high 'player liquidity' – having lots of players online at the same time – allowing the game to matchmake or fill lobbies quickly and avoid using 'bots' (AI opponents used in the absence of real opponents), resulting in a poor player experience.
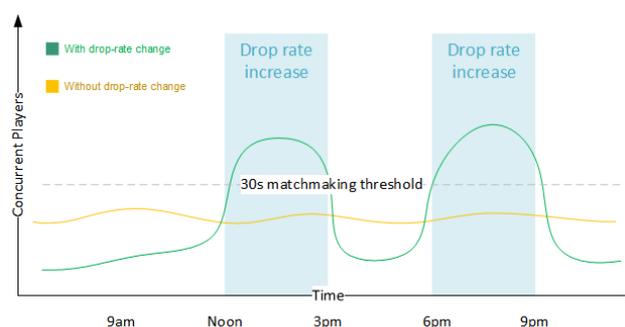
Using a similar method to events, player liquidity can be improved by encouraging players to come to the game at certain 'prime times'. If players know that drop rates on loot boxes are increased during certain periods, then this should encourage a preference to engage during these periods and subsequently improve player experience and reduce churn (players leaving the game).

> *"Liquidity (having enough active players) is king - this is actually super important because the more concurrent players you have in the game, the faster players get matchmade, and enter battle… we want to have a 90% probability of matchmaking players in under 30seconds to actually have a good experience"* (Fodor 2019)

This can be important immediately after the release phase of a game when it has relatively few users; users need to have a good experience in this phase of the game's lifecycle to avoid 'churn' and allow the game to grow.

Meaningful Content

There is a general accepted rule that loot boxes should not yield useless items. (Telfer 2018) and that each of its contents should be something useful to the player (even if it's not the item they had hoped). (Agell 2016)

> *"Loot boxes do this thing where there's enough good rewards that even if you don't get the item that you really wanted, there's enough good stuff that you're not disappointed… 'I wanted this Golden Axe, but this Diamond Dagger? I got a use for this thing!'"* (Patrick McGrath)

While young players recognise implementations of these mechanics, they do not tend to use a catch-all term (loot box, gacha etc).

> *"When it comes to gaming [children] don't talk to us about loot boxes. They talk about packs, they talk about the currency (Robux, V Bucks, Fifa Coins), but they don't specifically mention the term 'loot boxes'… There is no generic understanding or existence of a term that the core audience understands… They'll talk about content; skins, weapons, packs, but they won't talk about 'loot boxes' per se"* (Helenor Gilmour)

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Trends

Games development is faddy; certain tropes become popular and start to appear in other games. This could be because there is an audience for this new component and players expect to see these features, or simply that successes in live ops games are adopted as 'best practice' soon after.

> *"Free-to-play happened to be a novelty, and within that [loot boxes] happened to be a novelty; a monetization system that was interesting-looking and exciting… The games industry is really fad-based… one hit game is imitated and talked about, so there was probably quite a bit of bandwagon-jumping"*

> *"…I think that mad scramble towards 'every game must have gacha' is kind of over. Games have come out proving that you don't need gacha to have a successful economy."* (Will Luton)

Revenue

Loot boxes are generally seen as a strong monetization method, ultimately driving revenue up. But it should be noted that this could be due to improved player retention (players staying in a game for longer simply means more revenue), better engagement. There are numerous examples of successful current games without loot box systems. It's difficult to single-out loot boxes as a sole money-making mechanic vs a mechanic which drives other metrics which result in increased revenue.

> *"If [shoehorning loot boxes into any game to improve revenue] worked; it would make my job a lot easier"* (Will Luton)

Nevertheless, there is a discussion in industry which links loot boxes indirectly with many particularly successful live ops games.

Industry Opinions of loot boxes

We discussed the breadth of opinion around the lootbox phenomenon with expert interviewees and noted recurring themes (often echoed in online industry discourse).

There's a feeling that bad press around loot boxes is likely to have resulted from games 'shoehorning' these systems into an unsuitable game (or business model), or certain 'bad actor' developers taking these mechanics 'too far' in order to make money, but that this doesn't represent all developers.

> *"Sure, they can play to earn it, but the whole idea of Loot Crates (gacha mechanic) is to distort the investment cost player needs to make to achieve the goal. In other words, you can get Darth Vader in your next Hero Loot Crate or you could not. When it takes about 2 and a half hours of gameplay to earn enough Credits to purchase a Hero Loot crate it is clear that the system is tuned to maximize conversion - or in this case the feeling of getting screwed over."* (Katkoff 2017)

> *"For every bad PR spin piece, there are 100 games that are doing the right thing, they have the right intention… Maybe I've just been in this system for too long, but for me, it's very easy to see the intent, and from what I've seen coming out of gaming communities, I don't think they're far off from it too; when they see a poorly constructed or negative intent in a loot box system, they let 'em hear it."* (Patrick McGrath)

Some developers expressed a regret in employing specific implementations of Loot box systems in their games, despite their success in doing so, citing morale issues among team members.

> *"We won in terms of money but... Team morale was very low; people [developers] started to be ashamed of what they're doing… The features made after that [negative reviews] were made slower because people were really afraid to get another wave of hatred from our community. That was the first time for us that we understood that we are doing something wrong and we need to change this thing"* (Krasilnikov 2020)

Responsible use:

There is a sentiment among the developers that we spoke to that responsible use was important in use of these mechanics and that this was part of their development considerations. Additionally, it was made clear that while there may be unscrupulous developers exploiting loot boxes, it's not the case that unscrupulous developers use loot boxes while well-meaning developers do not.

> *"There were discussions around that point of 'are [loot boxes] being used responsibly?'; 'Are they being used ethically?'; 'Are they taking advantage of players?' (and I think I have seen examples of that). That's how the discussions progressed within the companies I worked for. There are many positives and benefits to using these in a game… how do we use these in a way that they add value to the game for the user? and we are responsible in the way that we do it?"* (Jade Sowa)

Beano interviews revealed that young players can understand different implementations of 'loot box' systems and can identify whether the items in them are critical for performance and progress (FIFA) or are merely cosmetic (Fortnite). Cosmetic items are viewed as important to the young audience as with many real-world playground crazes (toys, fidget spinners etc), One of the key motivations driving play in children is collectability, and digital skins are no different.

Further Discussion

In discussion with expert interviewees, developers generally recognised the need to act to protect vulnerable users, and described how this was a win-win situation; avoiding potential difficulty for these users would mean a more sustainable relationship between developer and player, benefiting both.

Generally, there is a worry that a simple outright ban on 'Loot boxes' specifically will have a less positive effect than intended, for both industry and players as new alternative

mechanics appear. A recurring topic was that video games is a fast-moving industry for which any regulation needs to be flexible enough to move with change. Specifically, it was raised that a sizable part of the games industry is not multinational corporations, but small studios who may be unable to pivot to large-scale change, resulting in damage to their businesses.

A general call for more research was apparent, and a greater emphasis on identifying and protecting vulnerable users.

> *"There's a bit of a moral panic around loot boxes at the moment because it looks – from outside – almost like a slot machine; it's like a random reward that functions effectively the same as gambling. But because of the fact that in most of these games there's no ability to cash out (or if you can it's by very convoluted means), it doesn't have the most pernicious effects of gambling; people chasing losses in the same way (at least financial losses). That's not to say that people aren't vulnerable within these games. I think that my [understanding] of what's going on is that it's closer to consumer problem spending than it is to gambling, in the sense of how people may spend on clothes and get themselves into debt over that. I think the same sort of triggers are applied because often these games have an association with status, rather than it being about financial gains."* (Will Luton)

> *"I was thinking about how you legislate for this or how do you regulate it without harming the development community? Because people that make games are not all big corporations; they can be one person by themselves or a little group of five people that have come together (In fact, probably most games are like that) and we need to make sure that those people still have freedom to do it and are not stopped because there's legislation or regulation that they just don't have the bandwidth to deal with."* (Jade Sowa)

Annex B – Market Analysis Search

Criteria	Decision
Pre-defined keywords composing the search string present on title, abstract, or keyworks (Round 2)	Inclusion
Publication written in English (Round 2)	Inclusion
Publications described as 'Editorial', 'News', 'Magazine articles', 'Book Chapter', 'Note', 'Letter', 'Erratum' (Round 2)	Exclusion
Publication not accessible (Round 2)	Exclusion
Duplicated publication (Round 2)	Exclusion
Articles published before 2010 (Round 1)	Exclusion
Publications only mentioning loot boxes without the potential for developing the academic literature (Round 3)	Exclusion
Publication not contributing to define the nature and scope of loot boxes and microtransactions (Round 3)	Exclusion

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This review's Databases and respective collections included EBSCOhost Research Databases[1], Scopus, and Web of Science[2]. Overall, the search terms used were: *(loot boxes or loot-boxes) AND (market OR analysis OR consumer OR microtransactions OR strategy OR freemium OR metacurrency OR gamification OR monetization OR platform OR in-game transaction OR gated progression OR in-game purchases OR in-app purchases OR Electronic Arts OR Bethesda OR Sony OR Microsoft OR Nintendo OR King OR Rovio OR ea OR Steam)*. This review covered research published between 2010 and Feb/2021.

Articles included in the analysis

Title	Author(s)	Published In	Year of publication
Are Loot Boxes Addictive? Analyzing Participant's Physiological Arousal While Opening a Loot Box	Brady A., Prentice G.	Games and Culture	2019
Continuing a community of practice beyond the death of its domain: examining the Tales of Link subreddit	Britt B.C., Britt R.K., Hayes J.L., Oh J.	Behaviour and Information Technology	2020

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[1] Databases: Academic Search Complete; British Education Index; Business Source Premier; Child Development & Adolescent Studies; eBook Collection (EBSCOhost);Education Abstracts (H.W. Wilson);Educational Administration Abstracts; Film & Television Literature Index with Full Text; Historical Abstracts with Full Text; Library, Information Science & Technology Abstracts; MathSciNet via EBSCOhost; MEDLINE;MLA Directory of Periodicals; MLA International Bibliography; Regional Business News

[2] Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI

Title	Author(s)	Published In	Year of publication
Associations between loot box use, problematic gaming and gambling, and gambling-related cognitions	Brooks G.A., Clark L.	Addictive Behaviors	2019
Bringing transparency and trustworthiness to loot boxes with blockchain and smart contracts	Carvalho A.	Decision Support Systems	2021
Loot Box Pricing and Design	Chen N., Elmachtoub A.N., Hamilton M., Lei X.	EC 2020 - Proceedings of the 21st ACM Conference on Economics and Computation	2020
The relationship between problem gambling, excessive gaming, psychological distress and spending on loot boxes in Aotearoa New Zealand, Australia, and the United States-A cross-national survey	Drummond A., Sauer J.D., Ferguson C.J., Hall L.C.	PLoS ONE	2020

Title	Author(s)	Published In	Year of publication
An Exploratory Study of Individual and Parental Techniques for Limiting Loot Box Consumption	Gong L., Rodda S.N.	International Journal of Mental Health and Addiction	2020
Esports betting and skin Gambling: A brief history	Greer N., Rockloff M., Browne M., Hing N., King D.L.	Journal of Gambling Issues	2019
Taking a gamble: Analyzing how the regulation of loot boxes in video games may change a billion dollar industry	Hamilton T.	University of Illinois Law Review	2020
A Research of Social Game Users' Attitude to 'Gacha' Probability Announcement	Hiramatsu A.	Proceedings - 2019 8th International Congress on Advanced Applied Informatics, IIAI-AAI 2019	2019
The 'gambling turn' in digital game monetization	Johnson M.R., Brock T.	Journal of Gaming and Virtual Worlds	2020

Title	Author(s)	Published In	Year of publication
How game users consume virtual currency: The relationship between consumed quantity, inventory, and elapsed time since last consumption in the mobile game world	Kaneko Y., Yada K., Ihara W., Odagiri R.	IEEE International Conference on Data Mining Workshops, ICDMW	2019
Infinite Loot Box: A Platform for Simulating Video Game Loot Boxes	Kao D.	IEEE Transactions on Games	2020
Risk Factors of Problem Gaming and Gambling in US Emerging Adult Non-Students: The Role of Loot Boxes, Microtransactions, and Risk-Taking	King A., Wong-Padoongpatt G., Barrita A., Phung D.T., Tong T.	Issues in Mental Health Nursing	2020
Predatory monetization schemes in video games (e.g. 'loot boxes') and internet gaming disorder	King D.L., Delfabbro P.H.	Addiction	2018
The convergence of gambling and monetised gaming activities	King D.L., Delfabbro P.H.	Current Opinion in Behavioral Sciences	2020

Title	Author(s)	Published In	Year of publication
Loot box engagement and problem gambling among adolescent gamers: Findings from a national survey	Kristiansen S., Severin M.C.	Addictive Behaviors	2020
The relationship of loot box purchases to problem video gaming and problem gambling	Li W., Mills D., Nower L.	Addictive Behaviors	2019
eSports, skins and loot boxes: Participants, practices and problematic behaviour associated with emergent forms of gambling	Macey J., Hamari J.	New Media and Society	2019
The games we play: Relationships between game genre, business model and loot box opening	Macey J., Hamari J.	CEUR Workshop Proceedings	2019
The macro problem of microtransactions: The self-regulatory challenges of video game loot boxes	McCaffrey M.	Business Horizons	2019

Title	Author(s)	Published In	Year of publication
Come for the Game, Stay for the Cash Grab: The Ethics of Loot Boxes, Microtransactions, and Freemium Games	Neely E.L.	Games and Culture	2021
How Does Games Critique Impact Game Design Decisions? A Case Study of Monetization and Loot Boxes	Perks M.E.	Games and Culture	2020
Watch your loot boxes! – recent developments and legal assessment in selected key jurisdictions from a Gambling law perspective	Schwiddessen S., Karius P.	Interactive Entertainment Law Review	2018
Long-Term Effects of In-Game Purchases and Event Game Mechanics on Young Mobile Social Game Players in Japan	Shibuya A., Teramoto M., Shoun A., Akiyama K.	Simulation and Gaming	2019
Costs to Compete - Analyzing Pay to Win Aspects in Current Games	Tregel T., Schwab M.C., Nguyen T.T.L., Müller P.N., Göbel S.	Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)	2020

Title	Author(s)	Published In	Year of publication
Loot boxes are gambling-like elements in video games with harmful potential: Results from a large-scale population survey	von Meduna M., Steinmetz F., Ante L., Reynolds J., Fiedler I.	Technology in Society	2020
Which Implementations of Loot Boxes Constitute Gambling? A UK Legal Perspective on the Potential Harms of Random Reward Mechanisms	Xiao L.Y.	International Journal of Mental Health and Addiction	2020
Beyond loot boxes: A variety of gambling-like practices in video games are linked to both problem gambling and disordered gaming	Zendle D.	PeerJ	2020
Problem gamblers spend less money when loot boxes are removed from a game: A before and after study of Heroes of the Storm	Zendle D.	PeerJ	2019

Title	Author(s)	Published In	Year of publication
Paying for loot boxes is linked to problem gambling, regardless of specific features like cash-out and pay-to-win	Zendle D., Cairns P., Barnett H., McCall C.	Computers in Human Behavior	2020
The changing face of desktop video game monetisation: An exploration of exposure to loot boxes, pay to win, and cosmetic microtransactions in the most-played Steam games of 2010-2019	Zendle D., Meyer R., Ballou N.	PLoS ONE	2020
The prevalence of loot boxes in mobile and desktop games	Zendle D., Meyer R., Cairns P., Waters S., Ballou N.	Addiction	2020
Adolescents and loot boxes: Links with problem gambling and motivations for purchase	Zendle D., Meyer R., Over H.	Royal Society Open Science	2019

Annex C: Drivers of Problematic Play Search Details

Criteria	Decision
Fully peer-reviewed journal publications.	Inclusion
Title, abstract or keywords include "loot box" (or a cognate term).	Inclusion
Types of studies: empirical studies relating harmful outcomes with loot boxes.	Inclusion
Language: English-language studies.	Inclusion
Region: Anglophone nations.	Inclusion
Timespan: last 5 years.	Inclusion
Fully peer-reviewed journal publications.	Inclusion
Title, abstract or keywords include "loot box" (or a cognate term).	Inclusion

Databases: SCOPUS, Web of Science

Loot Boxes and digital gaming: A rapid evidence assessment

Search: TITLE-ABS-KEY (loot AND box*) OR TITLE-ABS-KEY (loot AND crate*) OR TITLE-ABS-KEY (loot-box*) OR TITLE-ABS-KEY (loot-crate*) OR TITLE-ABS-KEY (gatcha OR gacha) OR TITLE-ABS-KEY (loot* AND whales) OR TITLE-ABS-KEY (loot* AND minnows) OR TITLE-ABS-KEY (loot* AND minnows) OR TITLE-ABS-KEY (loot* AND friction AND point) OR TITLE-ABS-KEY (loot* AND grinding) OR TITLE-ABS-KEY (loot* AND taps) OR TITLE-ABS-KEY (loot* AND sinks) OR TITLE-ABS-KEY (loot* AND platform) OR TITLE-ABS-KEY (loot* AND battlepass) OR TITLE-ABS-KEY (loot* AND random AND reward AND mechanic*) OR TITLE-ABS-KEY (loot* AND paywall) OR TITLE-ABS-KEY (loot* AND iap) OR TITLE-ABS-KEY (loot* AND mtx) OR TITLE-ABS-KEY (loot* AND arpu) OR TITLE-ABS-KEY (loot* AND arppu) OR TITLE-ABS-KEY (loot* AND drop AND rates) OR TITLE-ABS-KEY (loot* AND harm)

Articles included in the analysis

Title	Author(s)	Published In	Year of publication
Secondary Analysis of Loot Box Data: Are High-Spending "Whales" Wealthy Gamers or Problem Gamblers?	Close et al.	Addictive Behaviours	2021
Adolescent Problem Gaming and Loot Box Purchasing in Video games: Cross-sectional Observational Study Using Population-Based Cohort Data	Yamasaki S., et al.	Serious Games	2021

Title	Author(s)	Published In	Year of publication
Effects of self-isolation and quarantine on loot box spending and excessive gaming-results of a natural experiment	Hall	PeerJ	2021
Loot boxes are gambling-like elements in video games with harmful potential: Results from a large-scale population survey	Von Meduna et al.	Technology in Society	2020
Loot Boxes, Gambling, and Problem Gambling Among Young People: Results from a Cross-Sectional Online Survey	Wardle and Zendle	Cyberpsychology, Behaviour, and Social Networking	2020
Fortnite microtransaction spending was associated with peers' purchasing behaviors but not gaming disorder symptoms	King et al.	Addictive Behaviours	2020
Loot box engagement and problem gambling among adolescent gamers: Findings from a national survey	Kristiansen and Severin	Addictive Behaviours	2020

Title	Author(s)	Published In	Year of publication
Risk factors of problem gaming and gambling in US emerging adult non-students: The role of loot boxes, microtransactions, and risk-taking	King, A. et al.	Issues in Mental Health Nursing	2020
Loot Boxes and Gambling: Similarities and Dissimilarities in Risk and Protective Factors	De Camp, et al.	Journal of Gambling Studies	2020
The relationship between problem gambling, excessive gaming, psychological distress and spending on loot boxes in Aotearoa New Zealand, Australia, and the United States-A cross-national survey	Drummond et al.	PLoS One	2020
Gaming-gambling convergence: evaluating evidence for the 'gateway' hypothesis	Delfabbro and King	International Gambling Studies	2020

Title	Author(s)	Published In	Year of publication
Beyond loot boxes: A variety of gambling-like practices in video games are linked to both problem gambling and disordered gaming	Zendle	PeerJ	2020
The relationship of loot box purchases to problem video gaming and problem gambling	Li et al	Addictive Behaviour	2020
Associations between loot box use, problematic gaming and gambling, and gambling-related cognitions	Brooks and Clark	Addictive Behaviour	2020
Adolescents and loot boxes: Links with problem gambling and motivations for purchase	Zendle et al.	Royal Society Open Science	2020
Loot boxes are again linked to problem gambling: Results of a replication study	Zendle and Cairns	PLoS One	2020

Title	Author(s)	Published In	Year of publication
How game users consume virtual currency: The relationship between consumed quantity, inventory, and elapsed time since last consumption in the mobile game world	Kaneko et al.	IEEE Xplore	2019
Problem gamblers spend less money when loot boxes are removed from a game: A before and after study of Heroes of the Storm	Zendle	PeerJ	2019
Rare Loot Box Rewards Trigger Larger Arousal and Reward Responses, and Greater Urge to Open More Loot Boxes	Larche	Journal of Gambling Studies	2019
Long-Term Effects of In-Game Purchases and Event Game Mechanics on Young Mobile Social Game Players in Japan	Shibuya et al	Simulation & Gaming	2019

Title	Author(s)	Published In	Year of publication
Video game loot boxes are linked to problem gambling: Results of a large-scale survey	Zendle and Cairns	PLoS One	2018