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policy paper

Safer by design: Building a collaborative, integrated and evidence-based framework to inform the regulation and mitigation of gambling product risk

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Abstract

Evidence suggests that harms may result from gambling participation as a result of a complex interaction between individual differences among consumers, environmental factors, and the characteristics of the gambling product. The latter of these factors, broadly referred to in this paper as *product risk,* has received increased policy attention in recent years. Product-focussed approaches to harm reduction, however, are under-developed relative to other forms of player protection and likely reflects the limitations of existing evidence and relative complexity of the topic. In this position paper, we define and explain the concept of product risk and consider what is currently known regarding the link between gambling products and harm. The paper describes the present barriers to develop effective product risk regulation and harm mitigation strategies. These include the competing interests of stakeholders, limited collaboration and information sharing, clear roles, responsibilities and leadership and a lack of integrated evidence-informed approaches. In response to these challenges, we propose adopting a framework comprised of a series of principles to progress this contested area of policy. The framework encourages better collaboration and communication between stakeholders; the accelerated production of valid and reliable evidence; a strategic alignment of stakeholder activity; and, more effective and efficient approaches to assessing and mitigating product risk.

Keywords: Gambling, product design, product safety, harm reduction, regulation

Introduction

Increasing recognition now exists in the field of gambling studies that a narrow focus on individual behaviour and pathology is unlikely to be sufficient to inform regulatory policies which seek to address problem gambling and reduce harm (Abbott, 2020; Delfabbro & King, 2017; Livingstone et al., 2019). Multiple lines of evidence support the view that the availability, accessibility and design of gambling products also play an important role in influencing the prevalence of gambling, gambling that causes harm, and overall gambling expenditure (Gainsbury, 2012; Gainsbury, Angus et al., 2019; Livingstone et al., 2019; Parke et al., 2016; Vasiliadis et al., 2013). At a commercial level, product design and innovation is central to maintaining revenue and market-share within the gambling industry (Gainsbury, 2012; Goodwin et al., 2017; Parke & Griffiths, 2011). Changes to the nature, volume and technology design of products, as well as the medium through which they are supplied, are all elements thought to influence the accessibility and demand for gambling and its impact (Livingstone & Woolley, 2007; Productivity Commission, 2010). For example, studies have documented the effects of expanding gambling markets over time (Storer et al., 2009); the impact of variations in the mix or type of gambling products (e.g., continuous vs. less continuous activities) (Dickerson, 1993; Livingstone & Woolley, 2007; Parke & Parke, 2019); and how specific product features (e.g., near-misses, jackpot features) might be associated with different player responses (Belisle & Dixon, 2016; Li et al., 2015; Parke et al., 2016; Pislak et al., 2019).

The role of gambling environments and the supply of products now feature prominently in safer gambling discussions and workstreams in welfare reform, commercial and regulatory contexts. For example, politicians are highlighting the need to determine the level of risk posed by gambling products before entering the market (p. 50, House of Lords Select Committee on the Social and Economic Impact of the Gambling Industry, 2020[1]); regulators are holding consultations to inform licencing conditions to make gambling products safer (e.g., the Gambling Commission in Great Britain[2]; the Netherlands Gaming Authority[3]); welfare and reform groups are demanding better controls over the addictiveness of games; and trade bodies are encouraging members to adopt game design policies (e.g., Level 4 of World Lottery Association's Responsible Gaming Framework[4]) or are leading working groups to address the issue (e.g., Betting and Gaming Council[5]).

A central focus of much of these workstreams and consultations is about how to balance the tension between the commercial, recreational and health implications of gambling.

[1]https://committees.parliament.uk/publications/1700/documents/16622/default/

[2]https://consult.gamblingcommission.gov.uk/author/game-design-consultation/

[3]https://kansspelautoriteit.nl/wet-koa/beleidsregels/concept/

[4]https://www.world-lotteries.org/images/documents/responsible-gaming/wla-rgf-level4-14en.pdf

[5]https://bettingandgamingcouncil.com/uncategorized/online-games-design-standards/

Studies across the world continue to show that gambling remains a popular recreational activity for around 70% of adults and a regular past-time for approximately 30%, although with certain variations across countries (e.g., Calado & Griffiths, 2016; Public Health Agency of Sweden, 2016; Rockloff et al., 2019). People gamble to win money, to avoid boredom or stress, to socialise and for excitement (Chantal et al., 1995; Parke et al., 2016). The regulated commercial gambling industry provides a source of taxation revenue, employment and tourist development, but also a way to reduce the potential influence of illegal or unregulated (often criminally aligned) industries that can arise in the absence of a legalised industry (Productivity Commission, 1999). Despite these benefits, it is known from epidemiological research and social service reports that gambling can also be harmful to significant proportion of the community (Browne et al., 2016; Productivity Commission, 2010). Epidemiological estimates suggest that around 5% of adults experience moderate to severe problems associated with gambling at any point in time (Calado & Griffiths, 2016) and that this often entails negative impacts on areas such as people's financial, psychological, social and employment wellbeing (Browne et al., 2016, 2017). This situation places government bodies, including regulators, in the position of having to determine the best strategies to protect the health of the population in the absence of sufficient evidence, in a way that balances the competing interests, and manages the growth and operation of the gambling industry. Such considerations are not, of course, unique to gambling, but similarly apply to other sectors, including alcohol (Siegfried, 2019), fast-food (Ries, 2013) and recreational drug use (Smart & Liccardo Pacula, 2019).

Several higher-level frameworks or approaches have been advanced to guide regulation and responses to the negative impacts of gambling. One often cited approach is informed by the Reno Model (Blaszczynski et al., 2004). The Reno model introduces the concept of responsible gambling which is defined as a framework for preventing, minimising or reducing the harm associated with gambling. Often misrepresented by its critics as downplaying industry responsibility (Hancock & Smith, 2017), this model was expanded upon in subsequent papers (Blaszczynski et al., 2008, 2011) and describes the shared responsibilities of different stakeholders toward consumer protection. Gambling is a legally permissible leisure activity, but which should be subject to regulation and oversight by government. The gambling industry is seen as having a responsibility to promote informed choice and to prevent harm and this should include taking reasonable steps to consider how products are designed and promoted.

Similar perspectives are promoted by public health approaches to gambling (Korn & Shaffer, 1999; Victorian Responsible Gambling Foundation, 2015; Wardle et al., 2018). Classic public health approaches, as Korn and Shaffer (1999) argue, refer to the so-called epidemiological triangle in which the "public health issue"[6]—in this

[6]Note that not all researchers necessarily endorse the "disease" model of gambling. In Korn and Shaffer's (1999) paper the disease metaphor is applied as a useful way to apply public health logic. A broader literature generally supports the view that problems associated with gambling arise from the complex interaction of individual, social, cultural and environmental factors, including product characteristics (Griffiths & Delfabbro, 2001).

case, gambling-related harm—is seen as arising from the negative impact of excessive interaction with gambling products (the agent) upon gamblers (the host). Central to the public health approach is the outcome of excessive gambling: harm. Attempts are made to quantify this harm, either at an individual level (Productivity Commission, 1999) or at a community level (Browne et al., 2016, 2017; Thorley et al., 2016). For example, Thorley and colleagues estimate an "excess fiscal cost" to government of between £260m–£1.6bn per year for Great Britain as a whole, although this does not factor in benefits or opportunity costs. More recently in Sweden, the overall "societal cost," comprising direct (e.g., health costs), indirect (e.g., lost productivity) and intangible (e.g., reduced well-being) costs, were estimated to be in the region of €1.42bn in 2018 (Hofmarcher et al., 2020).

In its original formulation, the public health approach shares a lot in common with established interactive models of problem gambling (e.g., Blaszczynski & Nower, 2002). In an interactive model, problem gambling and harm is seen as arising from a combination of individual level, environmental and product factors (Griffiths & Delfabbro, 2001). Individual level factors can be genetic (e.g., Shah et al., 2005), psychological (McCormick et al., 2012; Petry, 2005), social or cultural (Russell et al., 2018), whereas product or supply features related principally to the accessibility, availability and nature of the product. Neither is seen as sufficient on its own. Support for the emphasis on supply-side factors arises from the finding that: (1) gambling opportunities and liberalisation seem to involve an increase in gambling and (2) that certain product designs seem more likely than others to give rise to gambling harm (as we will examine presently). However, supply side features cannot be the only explanation in that many people gamble, some regularly, without reporting any significant harm (Delfabbro & King, 2019). The established public health model (Korn and Shaffer, 1999; Shaffer and Korn, 2002), encourages approaches that attempt to understand why certain people appear to be more vulnerable to developing problems with gambling, and particularly in relation to certain products. It also emphasises the importance of primary and secondary interventions that attempt to prevent or minimise harm in the whole population and amongst those more at risk, rather than rely on tertiary interventions for those experiencing harm (e.g., treatment).

These conclusions would appear to logically follow from much of the evidence in the field. However, as Delfabbro and King (2020a, b, c) and Shaffer, Blaszczynski, and Ladouceur (2020) have noted, much of the debate around public health theory has become conflated with activist or advocacy-based approaches (David et al., 2019) that focus almost exclusively on the harm associated with gambling products.[7] Studying individual level risk factors or even the prevalence of problem gambling is considered undesirable because it is seen as complicit in the industry denial of product risk, and a form of blame-shifting or stigmatisation of vulnerable individuals

[7]Advocacy based research is directed towards achieving a particular public policy objective, e.g., reducing gambling harm. In effect, evidence is selected and promoted to the extent that is it useful for this purpose.

(Livingstone et al., 2019; Reith, 2007). Symptomatic of this perspective have been attempts to avoid references to the disorder (i.e., problem gambling or disordered gambling) and focus exclusively on gambling harm (Livingstone et al., 2019). However, somewhat ironically, when referring to specific action to reduce harm, many modern reports informed by the public health advocacy approach appear to converge with the traditional public health approach and Reno approach. Benefits, in the form of harm reduction, are seen as potentially arising from placing greater emphasis on the role of industry and gambling products (Livingstone et al., 2019). According to these views, the delivery of safer gambling products is considered possible if greater scrutiny were to be directed towards the role of specific product features. Certain examples have included bet sizes, presence of near misses or the availability of autoplay features (Parke et al., 2016) as well as the incorporation of protective strategies such as pre-commitment technology (Ladouceur et al., 2012) which focus on supporting the individual rather directly modifying the product.

In this paper, we examine existing processes for making gambling products safer in an effective, efficient and fair way. Specifically, we

- explain *what is meant by product risk* and provide an overview of what is known about the links between gambling products and harm.
- explore the *stakeholders* that are most involved with, and influenced by, issues relating to product design.
- examine how different perspectives might shape the *quality and robustness of evidence* in product risk.
- highlight the current challenges and tensions that currently exist and how these have impeded progress in developing effective policies and processes for evaluating product safety.
- argue for the importance of implementing a "*whole systems*" *approach* to developing strategies and interventions.
- discuss the challenge of *assessing product risk* using relevant examples from different jurisdictions are cited to illustrate these challenges.

We argue that policies and practices relating to product design are best informed by clearly stated and shared principles. To this end, we outline what we believe to be the core principles that should be applied to facilitate this outcome. The final section of the paper brings together these principles, the relevant stakeholders and an analysis of processes and inter-relationships in the form of a schematic framework. The overall aim is to promote a shared understanding and over-arching perspective on how product safety might be approached more effectively, efficiently and fairly in the future from a regulatory, industry and broader policy perspective, with the ultimate aim of protecting consumers from harm.

Product Risk Literature

The term product risk could be defined in several ways. In essence, the term refers to the extent to which a product, including the game, its platform or its structural features,[8] is likely to: (1) increase the risk of gambling harm for gamblers in general and/or (2) pose a particular risk of harm for those who are more vulnerable to developing problems with gambling (e.g., a feature that particularly appeals to higher risk gamblers). Such harm would be seen to arise from riskier patterns of behaviour, and this could include: excessive time or money spent on gambling (e.g., more than the person could afford), impulsive betting, a loss of behavioural control, or chasing losses.

Evidence in support of the differential risk associated with different gambling activities or specific features has emerged gradually over the decades. Such research can generally be categorised according to the level at which a product is being examined. At a macro level, there are studies that have examined the risks posed by a particular type or class of game (e.g., slots versus table games). Consideration can also be given to its platform[9] (e.g., features of the gambling website such as ease of financial transactions or responsible gambling information). At the micro level are studies which have adopted a more granular approach to examine the risks arising from exposure to the specific structural characteristic of a game (e.g., speed of play).

As outlined by Dowling and colleagues (2005), Delfabbro, King, Browne and colleague (2020), and Delfabbro and Parke (2020), comparisons of the relative risk of games can be examined using different lines of evidence including: (1) the level of problem gamblers observed in communities with or without the availability of particular types of games; (2) the proportion of gamblers on a particular class of activity who develop problems; (3) the proportion of higher risk gamblers who gamble on particular activities; (4) game types identified as most harmful by those currently in treatment; or (5) the level of high frequency/expenditure gambling on particular activities as compared with others. Most important are studies that have examined the relationship between participation in specific activities and problem gambling or harm after controlling for engagement in other activities (by employing multivariate models either using between or within-subject designs[10]).

[8]A game refers to a specific named activity—e.g., a variant of a slot game. A platform refers to how the game is made available—e.g., mobile vs. PC only; or the characteristics of the website in which a product is made available. A game "feature" would include elements as "autoplay," jackpot features, sub-stake wins, or bonus features. Some of these will be common to a class of activities, whereas some will only be available on some games (in the case of slots).

[9]The term platform can also refer to how the product or game is made available to consumers. Some games might be available on consoles or machines in land-based venues, whereas others may be available online and/or through mobile devices that allow electronic transfers or loading of funds rather than the use of physical money.

[10]A between subject design might compare the level of harm observed in slot machine gamblers vs. Table game players. A within subject design would look at whether the same individual appears to experience different impacts depending on what type of game or feature or structural characteristic to which the person was exposed—e.g., do people bet more when playing certain types of slot machine?

Studies that have applied this approach have generally confirmed that lottery products have been positioned at the lower end of the risk continuum, whereas highly continuous activities such as slot machines have appeared to entail the greatest risk, as based on the magnitude of odds-ratios or regression parameters (Afifi et al., 2010; Binde et al., 2017; Brosowski, et al., 2020; Castrén et al., 2018; Delfabbro & Parke, 2020; Delfabbro et al., 2020; Orford et al., 2013; Scalese et al., 2016).

Such comparisons based on technological differences are generally recognised to be time-limited and may not hold in the future because of the dynamic nature of product designs and developments in digital technology. It may be, for example, that the structural differences between game types are becoming less distinctive. For example, the relative high risk of slot games has been attributed to their rapid, continuous reinforcement (Mentzoni et al., 2012) and immersive game play features (e.g., near wins, Barton et al., 2017), bonus games (Landon et al., 2018; Livingstone & Woolley, 2007). But other forms of gambling, like in-play sports betting (Russell et al., 2019; Parke and Parke, 2019), for example, are evolving with similar attributes. As Auer and Griffiths (2013) suggest, in principle, games can be structured in ways that can induce greater risk, irrespective of game type. The shifting of the structural boundaries between games is rendering risk comparisons between games less meaningful and places further pressure on an already limited evidence base. For example, existing evidence that lottery games pose considerably less risk than casino games (Delfabbro & Parke, 2020) offers no guarantee that this will be true in future as the features of lottery products, much like other gambling products, will likely evolve as they adapt to dynamic consumer preferences and benefit from technological advances. For example, a need does exist for further research into whether digital scratch cards or instant win products or more machine based products (e.g., delivered by electronic vending machines are riskier than conventional retail products. Another important consideration is the increasing convergence of gambling and gaming which has led a blurring of the boundaries between gambling and gaming. Examples include the monetization of gaming outcomes, features such as loot boxes, and the gradual emergence of blockchain based tokenomics in modern gaming systems (Delfabbro & King, 2020e; King & Delfabbro, 2020).

Research has also considered the role of gambling medium or platform. Broadly speaking, games which are available online[11] have been suggested to pose greater risks than land-based activities because of increased accessibility and availability (Gainsbury, Wood et al., 2012; Wood et al., 2012), and less restrictions on stake sizes and game speeds (All-Party Parliamentary Group for Gambling Related Harm, 2020; Noyes & Shepherd, 2020), relative to their land-based equivalents. Online platforms, however, have been argued to offer more tailored player protection features, more detailed player feedback and opportunities to identify and intervene

[11]When referring to "online" a difference exists between mobile and desktop. Desktop will generally be restricted to a fixed location at home or work; mobile is potentially someone anywhere and anytime; laptop is somewhere in between.

with risky behaviour by using behavioural tracking and communication (Griffiths & Harris, 2017; Haeusler, 2019, Wood et al., 2014; Wood & Wohl, 2015).

Studies exploring the impact of a particular structural element of a product have typically focused on slot-machine characteristics, including: the speed of play; near wins; losses disguised as wins; bet sizes; prize structures; aesthetics, specifically lights and sounds; and the return to player (or RTP) (see Parke et al., 2016 for a comprehensive review). While the literature is less well-developed regarding the risks of individual game elements, some evidence has nevertheless emerged to suggest that riskier products are likely to comprise some mix of the following characteristics: (1) fast, continuous game play (Corr and Thompson, 2014; Eben et al., 2020; Harris & Griffiths, 2018; Mentzoni et al., 2012, Orford, 2019; Russell et al., 2019); (2) prize structures resulting in rates of winning and losing that are more variable, less certain and greater in magnitude (Percy et al., under review; Parke and Parke, 2017; Zack et al., 2020) but are still capable of holding the players attention[12] (Dow-Schull, 2012; Orford, 2019; Turner, 2011); and (3) are provided within choice architecture[13], or with misleading information, designed to exploit, rather than protect against, cognitive and emotional vulnerabilities exhibited during gambling (Behavioural Insights Team, 2018; Newall, 2019; Parke et al., 2016).

Mitigating Product Risk

Consistent with Korn and Shaffer's (1999) classic public health approach to understanding the epidemiology of gambling harm, the existing evidence provides convincing support for certain products (e.g., high intensity gaming machines are riskier than a lottery ticket) playing a critical role in the development and maintenance of problem gambling, although less is known about variations within product categories and about specific game features because of limitations of laboratory study designs. The best policies for managing product risks, however, are much less clear. Over the last two decades, safeguards which do not directly target the product (e.g., tools that enable players to set deposit limits or initiate self-exclusion, and algorithms for detecting and intervening with risky behaviour) have been more widely adopted. However, there have been suggestions that safeguards lack the necessary effectiveness (Orford 2019; Sulkunen et al., 2020). It is difficult to know to what extent this is attributable to a lack of industry will, lack of regulatory action, or a collective lack of stakeholder knowledge, but it is likely to be a combination of the three. Academic reviews have also suggested that certain safeguards have been limited in their effectiveness to date (e.g., preventative education, Ariyabuddhiphongs, 2013; limit-setting, Delfabbro & King, 2020d; self-exclusion, Gainsbury, 2014). Meanwhile, as greater attention is shifting to direct

[12]If games such as lottery draws involve large prizes that are too remote, where losing outcomes become too predictable, this is likely to reduce risk.

[13]Choice architecture refers to how choices are presented to consumers. A higher risk gambling product might not allow for options that mitigate risk—e.g., one has to bet on all lines to receive the chance of winning a certain outcome.

restrictions on the structural characteristics of products, certain experts (Livingstone et al., 2019, Orford, 2019; Yücel et al., 2018) suggest product restrictions offer a more effective means of mitigating the risks from gambling products. In both the UK and Australia, for example, there has been considerable debate about the merits of reduced maximum bets on gaming machines (2GBP maximum stake size in the case of Fixed Odds Betting Terminals in the UK and 1AUS on gaming machines in Australia). In both Australia and the UK, there have been debates about what are considered 'unfair' or misleading features on gaming machines, e.g., losses-disguised-as-wins, which may over-emphasise winning, or "spin stop features," which may give players a false sense of control (see Gambling Commission 2020 consultation on slot design[14]). Other topics that have attracted considerable public or regulatory debate include: the provision of in-play betting (Australia); the introduction of skill-based gaming machines[15] (Nevada) (Delfabbro et al., 2019; Gainsbury et al., 2020); automated gaming tables (Australia) (Armstrong, Rockloff, & Donaldson, 2016); or note acceptors on gaming machines (Australia) (Brodie et al., 2003).

To achieve the objectives of product risk mitigation however requires that those who make regulatory and product design decisions are informed about the risks associated with different products. However, as we will argue, the extent to which robust evidence is being used effectively to inform valid policy, regulatory and industry responses has been stymied by a number of complexities and barriers. These include barriers arising from the complex relationships and competing interests of different stakeholders; the lack of a clear purpose or principles relating to product safety; and a lack of a clear vision of how a better evidence-base might be developed, shared and utilised to inform both short-term as well as long-term decision-making relating to product design.

The stakeholders in product design and safety

Those having a stake in the development, implementation and outcomes of a product safety framework should be identified from the outset. In the case of product safety, stakeholders could have: (1) an interest in the strategic outcomes; (2) responsibility for a strategy's development and delivery; or (3) an ability to offer support through their expertise. While the stakeholder mix may vary by jurisdiction and market, we provide an indicative list to help guide our discussion (Table 1). These are broadly categorised into six groups (A–F). Examples under each category are provided along with a description of their role. The six categories of stakeholder defined in Table 1 are analytical simplifications that support the pragmatic analysis of a decision-making environment and are not intended to be absolutely distinct. For instance, within industry there are teams and groups focusing on reducing the negative

[14]https://consult.gamblingcommission.gov.uk/author/game-design-consultation/

[15]Skill-based gaming machines are those which often contain elements of video-games. In most of these games, the expected return to player is still negative and outcomes can often be pre-determined and only give the perception of skilful play.

Table 1
Stakeholders with interest in gambling product design

Stakeholder	Description
A. Political stakeholders	
Government	The government and civil service are responsible for setting gambling legislation. This typically includes responsibility for ensuring gambling products are delivered in a socially responsible manner as well as ensuring the gambling sector generates appropriate tax revenues for the state through employment and corporate taxes.
Actively Engaged Politicians	As well as primary decision makers there exist other politicians who actively engaged with influencing gambling policy, e.g., opposition politicians and those who have personal campaigning interests and influence via specific committees on gambling, for example.
Regulator	The regulator is responsible for issuing licenses to companies to provide gambling products and services. The regulator will set-out the licensing conditions and ensure gambling companies adhere to those conditions. These typically are focused on keeping crime out of gambling and protecting vulnerable people from gambling related harm.
B. Knowledge providers	
Advisory Boards	Such organizations are established with a range of experts, typically academics, to advise government and regulators on strategies to reduce gambling related harms.
Academia & Research Organizations	Clinicians and neuroscientists research the conditions and pathways that can cause gambling harms and additions. Social scientists, including economists, typically assess the negative social impacts of the Gambling Industry on consumers and wider populations as well as the positive contributions gambling can make.
C. Industry groups & affiliates	
Gambling Industry	Gambling operators (business-to-consumer, or B2C) provide gambling products—e.g., sports betting, lottery, casino games, slots, poker, bingo—to consumers via both land-based—e.g., casinos, betting shops, gambling arcades—and online channels. Gambling suppliers (business-to-business, or B2B) develop gambling products, typically software, hardware and services to gambling operators. These can include the development of gambling content such as casino table games, slots games, as well as electronic gambling machines and online gambling platforms (channels).
Sports Industry	Elements of the sports industry have a relationship with the Broadcast Media and Gambling Industry, typically by promotion of gambling products to consumers, e.g., sponsorship of sports leagues and teams, licensing of sports data. Sporting organizations may receive direct funding—e.g., through levies on horse-racing and sports betting.

(Continued)

Table 1 Continued.

Stakeholder	Description
D. Media organizations	
Press	The press media reports on social, political and business news and developments in the gambling sector. Press may also be influenced by the political orientation of the publication. However, written press also carries gambling advertising. For online press, a contentious subject like gambling may increase engagement and exposure to advertising.
Broadcast Media	The broadcast media will often have a relationship with the gambling industry, typically by enabling the advertising of gambling B2C products to consumers. Gambling sponsorship can also extend to sponsoring primetime television programming—e.g., People's Postcode Lottery sponsoring Emmerdale.*
E. Welfare organizations	
Charities	Charities will provide a variety of services that support problem gambling prevention and treatment and are typically funded by industry. These can include targeted research, training and education—for example in schools—as well as problem gambling treatment services—e.g., telephone service—and treatment centres.
Government Funded Health Services	As well as industry funded treatment services, some nationally funded services will also provide problem gambling treatment services.
Advocates for gambling reform	This group may include people with lived experience of gambling harm; academic and community critics of gambling, or religious / cultural leaders.
F. Consumers	
Existing customers	The legal age is set by each regulated jurisdiction and can vary by gambling product, and in most cases is restricted to adults. Customers should be given a position of informed consent how products work; the associated risks and benefits of engagement; and the probability of winning.
Prospective Customers	Including those new to gambling generally—e.g., turning legal gambling age—or new to a specific form of gambling. Informed consent is particularly important to this group.

*https://www.postcodelottery.info/news/latest-news/peoples-postcode-lottery-to-sponsor-emmerdale/

impacts gambling can have; and within the concern sector there are teams and groups who understand and wish to support the positive aspects of gambling. Nonetheless, the categories provide a useful framework for considering how the different stakeholders might work together to support better outcomes.

Product design is an issue of political significance because it is government and regulators who determine the supply of gambling products. If certain products or features, as we note above, are more or less associated with indicators of risk or confirmed harm, then government has a role in influencing the level of risk to which the public is exposed. It is worth noting that focus of legislation and regulation may be evolving as regulated markets mature. For example, in certain markets (e.g., UK, Spain and Italy) where there remain fewer challenges with regulatory objectives such as keeping crime out of gambling and promoting integrity, the objective of protecting the vulnerable may now be receiving the greatest attention.

Product is also clearly of relevance to the industry. The gambling industry's profitability is influenced by the extent to which it can provide products that meet regulatory requirements, but which also attract more consumers or larger profits. The next group, sometimes referred to collectively as welfare organisations, refers to those whose role is: (1) to deal with negative impacts of gambling, either by raising awareness of the harms associated with gambling through submissions, political lobbying or community activity or (2) to provide dedicated services (e.g., counselling, therapeutic treatments) to individuals and families affected by problem gambling. People who belong to these groups may observe changes in the prevalence of problem gambling and incidence of harms (e.g., numbers seeking treatment) based on changes in the availability of gambling products. For example, the rapid increase in gaming machines numbers in Australia and New Zealand in the 1990s. Another more recent example was the proliferation of high stakes gaming machines (referred to as Fixed Odds Betting Terminals) in the high street in the U.K. (Cassidy, 2020; Orford, 2019). They will also, based on the reported experiences of those in treatment, be able to identify games or features that they believe pose particular risks to vulnerable people. When this occurs, they will endeavour for changes to these products and this may extend to lobbying politicians or regulators to modify products. Such analyses can in principle, but only rarely in practice, have reference to a comparison group of players not experiencing harm.

Finally, a conduit for the debates and opinions articulated by the different stakeholders is the broadcast media and press which serves to create awareness and shape public opinion about the relevant merits (good or bad) of gambling activity in the particular society. Strong public debates, often in the media, can be observed for example since the 1990s about the risks of gaming machines in Australia, New Zealand, Norway and Greece. More recently in the UK, from 2012 to 2018, the media played a critical role in driving the campaign to reduce stakes on Fixed Odds Betting Terminals and have now focussed on online gambling. The influential role of media in determining gambling policy could reflect the slow pace of change within various legislative and regulatory structures relative to political and public opinion. If perceived by certain persons and groups as being unresponsive, this situation may

in turn create an environment for welfare and advocacy groups to create greater pressure by engaging with concerned politicians and the public through the media.

If the policy goal of a fair society were to protect consumers from unnecessary harm associated with riskier gambling products or features, then the ultimate decision about how this should be done would have to be made by regulators. An ideal decision would be one that targeted the right product or feature (i.e., it does pose a significant risk to players and to what extent) and would not have any unintended consequences. The change would be practical, achievable and yield outcomes as intended. Good governance would dictate that the government had been responsive to the needs of consumers and its mandate—to reduce harm—and considered the evidence and viewpoints offered by all stakeholders: the experiences of consumers and those negatively affected by gambling, the views of treatment providers, the research community, and the practical advice of the industry. However, observation of how debates around product risk have actually played out in reality indicates that this sort of co-operation and productive inter-play of stakeholders rarely occurs. In our view, constructive co-operation fails to occur for several reasons.

The first challenge in mitigating product risk is that different stakeholders have different policy objectives that predominantly align with their own interests and which do not coincide with those of certain other groups (see Abbott et al., 2018). With a few exceptions, less restrictive solutions will likely be preferred by the gambling industry (who develop and sell gambling products) whereas advocates for social change, viewing gambling a net harmful activity, may feel radical legislative changes are required to reduce harm. For example, church and welfare-based stakeholders, or those from problem gambling foundations, may refer to the harms incurred by gamblers, their families or the wider community and call for the removal of certain types of gambling, restrictions of gambling, or the removal of certain features (e.g., note acceptors, autoplay features are two that have arisen in Australia; or reduced stakes on Fixed Odds Betting Terminals in the U.K.). However, more subtle tensions may also exist within stakeholder sub-groups, again reflecting their different incentives. For example, policy preferences may vary by industry sector (e.g., betting companies may prioritise policies which preserve advertising in sport more than the lottery sector) or by charities (e.g., charities providing treatment may prioritise finding sustainable funding whatever their source more than charities campaigning for social change). These differences in interest and focus are evidenced in the submissions made to numerous inquiries into the gambling industry (e.g., House of Lords, 2020; Productivity Commission, 1999, 2020).

Given the existence of these vested interests, one might therefore argue that the best or least biased source of evidence might emerge from academic research or organisations funded to conduct research. In both principle and practice this is often the case. However, “least biased” is an important caveat. Academic work, like other forms of knowledge production, may be influenced by perceived and actual funder priorities, the ability to draw attention, to degree to which they support career progression, and the prior political perspectives and other interests of the researchers.

Many government-funded organisations (e.g., Victorian Responsible Gambling Foundation (VRGF), NZ Gambling Foundation) adopt a public health perspective, where the focus is on harm (VRGF, 2015). Although concerns are raised by the impact of certain products in published reports, relatively few studies are funded to enable to insights into the exact nature of the risks and the potential impacts of product changes. There may also be some hesitation about supporting research that might require engagement with industry stakeholders. For example, those who apply for the VRGF funding (and other organisations) are asked to indicate whether they have any industry connections or support for any work. Indeed, as indicated in certain reports funded by the VRGF (e.g., Livingstone et al., 2019) specifically raise concerns about the validity of industry supported research or researchers. Such views reflect a broader academic literature that has raised concerns about industry funding or involvement in academic research (e.g., Cassidy 2014; Cowlishaw & Thomas, 2018; Livingstone & Adams, 2016; Hancock & Smith, 2017). This work has included criticism of academics who have engaged with industry, but such views have, in turn, been criticised as often being driven by personal ideologies and advocacy goals (Delfabbro & King, 2020c; Griffiths & Auer, 2015).

If government bodies are placed in the awkward situation of being criticised for engaging with industry stakeholders, then it can yield several undesirable situations. First, there will be limits to the type of academic evidence which is available. Studies will have to rely predominantly on methodologies that do not have much engagement with either industry practices or the behaviour of people who gamble. Instead, studies will be reliant on self-report methodologies or simplified laboratory experiments that are often time-limited, lack genuine opportunities for risk-taking or loss, and which frequently involve novice or student gamblers (Parke et al., 2016; Peller et al., 2008). Second, situations may arise where inquiries into product design do not capture a sufficiently wide range of academic research (e.g., studies based on both objective as well as self-report data). The result is little engagement by industry, limited input from academics with knowledge about product design and its effects, and an over-reliance on evidence that has not been validated against commercial gambling behaviour—that is, the target of the regulation. The result will be policy that will be often based on limited evidence, little independent review, testing in the field, and industry knowledge.

Examples where this has happened in the context of product design have included discussions around the 2GBP stake in the UK or 1AUS bets in Australia as well as the considerable public debate directed towards a supposedly misleading feature in the slot-machine game Dolphin Treasure (DT). The DT example is illustrative of the challenges in this area. Much of this debate was driven by the concerns of a former victim of poker machine addiction and supported by academics critical of product designs (see Kaye, 2018; Livingstone, 2018). The Federal Court ruled that insufficient evidence had been mounted to show how the “near miss” design feature was related to product risk. A difficulty with this case was that it was not clear whether this product feature was reasonably likely to play a significant role in increasing the harm of gaming machines in Australia. Interest in this feature was strengthened by reference to academic studies (nearly all in the laboratory) that show

that people respond in a similar way to near-miss events as they do to wins, but there is little evidence that these events: (1) play a particularly significant role in the long-term maintenance of behaviour, or (2) if machines that provide such features more frequently are necessarily more likely to give rise to gambling harm. Instead, the existence of such debates often tends to be driven more by what has attracted attention by a minority, is considered "unfair" by critics of the industry, and which gains political and media traction. Some greater investigation of this feature using gamblers in situ may have provided certain insights into the apparent riskiness of feature (e.g., whether most players even noticed it) before the case went to court. The bet-sized debates perhaps reflect more legitimate concerns about the role of the cost of play but appeared to be arise in isolation of other considerations such as the extent to which gamblers might adjust the duration of their gambling or if most bets are indeed greater than these limits, even in high-risk gamblers.

In our view, a fundamental issue is that discussions around product safety have not been based on a consistent set of principles that set out strategies to encourage greater collaboration and sharing of insights relating to product design between stakeholder groups. Instead, topics that gain political, media and lobbying interest may often, as we indicate above, arise from other factors.

Acceptable standards of evidence on product risk

A further challenge in mitigating product harm is to develop an appropriate process for accumulating valid and reliable evidence. Even if one assumes that evidence is collected using appropriate methods and analysed correctly, whether quantitative, qualitive or mixed methods; self-report or experimental; clinical or non-clinically sourced, this does not ensure that decision-making will be fully informed. In increasingly politicised environments, it is important that evidence from different disciplinary areas is taken into account and that different stakeholders are consulted. If only certain types of evidence are sought (e.g., only lab based, or no lived experience insights are obtained), the findings could in turn be biased. Thus, roles and responsibilities for gathering evidence need to be agreed between stakeholders to avoid potential bias and to encourage acceptance of research outputs.

In our view, the use of data drawn from the industry is particularly important because of the need to obtain ecologically valid data concerning the likely influence of particular products or features. However, it is recognised that the topic of industry evidence is controversial in the addiction area. For example, the Tobacco industry[16]

[16]While parallels are often drawn between gambling and tobacco when considering the role of industry involvement in research there are some important differences to note. For example, the gambling industry, have access to critically important behavioural data that will likely prove to be critical in advancing our understanding of gambling behaviour. The variations and evolutions of gambling products are considerably more complex than tobacco products and so industry insights could play an important role in interpreting and applying research findings. Finally, there is no safe level of consumption for tobacco products, unlike in gambling where evidence suggests that the probability of harm is low when consumption is kept within modest limits (Currie et al., 2006).

suppressed evidence relating to the addictive potential of cigarettes. Another often criticised strategy of industry is to hide behind "unachievable evidence", by either claiming that no action should be taken until sufficient evidence is accumulated or that the only valid or "gold standard" empirical evidence is a randomised control trial. Since evidence takes a long time to accumulate and fully randomised trails are usually almost unachievable in the addiction area, this argument can be used as a strategy for stalling changes or making reforms. Such arguments ignore the fact that it was often correlational evidence that most effectively highlighted the links between tobacco consumption and negative health outcomes.

In our view, there should be scope, based on reasonable evidential or theoretical grounds, to take shorter term regulatory or industry action in reaction to certain products or features where there appears to be reasonable grounds to expect that harm to vulnerable consumers is occurring. However, action on this nature should allow opportunities for evaluation, factor in a time for review, and offer scope for modifications or rescinding any regulatory decisions found to be ineffective or counter-productive. Admittedly, in practical terms, it may not always be possible to know in advance—that is, at the design phase—which product features are likely to cause greater harm. Nevertheless, a reasonable knowledge of the literature can lead to the expectation that certain product designs are likely to be riskier than others (e.g., certain schedules of reinforcement or reinforcement patterns are known to maintain behaviour better than others) even before they enter the market. It is known, for example, that certain structural features can engender a false sense of control (e.g., skill buttons on slot machines). However, if products are already in the market, decisions can also be based on balanced appraisals of evidence, such as what appears to be detected in prevalence studies, certain academic papers, in laboratory studies, and from speaking with people who have the lived experience of problems with gambling in comparison with players who gamble safely. Once a decision is made about which feature or product to consider, the next part of the process should be develop an appropriate process for accumulating valid and reliable evidence.

The careful selection and design of research in regulatory and policy decisions is important. This is because policy decisions are significantly bounded by the evidence that is currently available. For example, whilst government and regulators would typically undertake neutral roles, they can be heavily influenced by activists and press when defining policy, who are themselves influenced by existing research. In the typical situation where, public pressure is focussed on addressing harm, there may be little appetite to commission any research exploring the potential benefits of certain forms of gambling or the potential unintended consequences of making changes. Similar pressure can also emerge from the industry which may attempt to exert influence over regulatory decisions through the process of "regulatory capture" (Carpenter, 2014; Engstrom, 2013). Regulatory capture can take several different forms, including financial, whereby donations from industry might be used to influence political decisions, or "cultural" or "cognitive" when regulators start to align their thoughts with industry as a result of lobbying, personal or social

connections, or where industry influenced individuals take up senior positions in regulatory bodies (Carpenter, 2014).

Difficult policy and regulatory decisions require comprehensive understanding in order weigh-up the relative advantages and disadvantages of the various policy levers available. For example, consider a programme of objective research designed to explore the social and health benefits from gambling. Were it to conclude that few benefits exist, it may provide greater justification for more restrictive product safety measures. Conversely, understanding better those who gamble without harm may inform the evidence base about protective factors, which may lead to findings which help mitigate harm. In the long run, partial examination of any complex behaviour hinders the development of the most effective strategic policies.

Safer product objectives also require appropriate interpretation, reporting and application of evidence. Accordingly, knowledge transfer could be facilitated by outlining implications for real world application in peer-reviewed journal articles, or by sharing accessible, plain-language, summary papers when new research is published. Equally, critical interpretation of evidence is required by those stakeholders responsible for its application (e.g., investing adequate time to understand new evidence including any potential limitations).

Adopting an integrated whole-systems approach to mitigating product risk

Addressing complex public health issues such as gambling harm is likely to require the strategic integration of *multiple strategies* supported by *multiple stakeholders*. The whole systems approach, as it is referred into the public health literature (Fink & Keyes, 2017; Rutter et al., 2017), involves the integration and alignment of harm reduction strategies and a commitment to shared goals among stakeholders even though they may have competing interests. If self-directed actions are inadvertently being duplicated, or routinely rejected by another stakeholder group, then the chances of making positive changes are going to be significantly reduced.

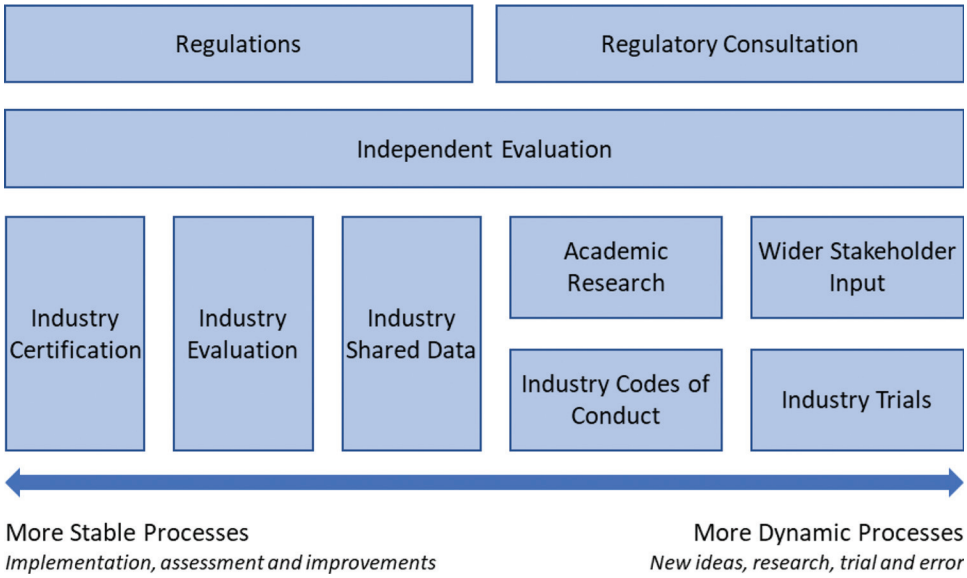
To illustrate this point, let us consider the potential of the gambling industry as a constructive stakeholder within a whole systems approach. As noted, the industry is well positioned to conduct trials that can provide important insights into the regulation of gambling products because of the ability to collect data within real-world environments. Opportunities exist for industry groups to work with independent researchers to determine how certain games or features appear to affect player behaviour (e.g., Blaszczynski et al., 2005). A number of examples relating to trials are precommitment or responsible gambling technology on gaming machines in several countries that provide examples of how this can be done (see Delfabbro & King, 2020d for a review or Blaszczynski et al., 2014). In the past, such collaborations or sharing of industry information has often only occurred incidentally for particular topical issues or where the industry has felt threatened. For example, when mandatory pre-commitment schemes were touted in 2010 for all

Australian gaming machines or pop-up messages were proposed for gaming machines in Australian State of Victoria and New Zealand, the industry was readily able to provide data to regulators concerning the impact). More recently, in the U.K., the Association for British Bookmakers, to stave off pressure to reduce stake size on Fixed Odds Betting Terminals, resorted to trialling a fairly poor conceived set of player protection measures; these were subsequently found to be ineffective (see Salis et al., 2015).

However, if such capacity and sharing of information occurred more readily and proactively, with trials designed in collaboration with a wider range of stakeholders, then debates about proposed regulations could be more strongly informed by evidence from the outset and efforts could align better with other stakeholders to maximise impact (see Figure 1 for an example of what this might look like in practice). Similar roles and responsibilities could be developed for each stakeholder and integrated into a whole system response offering the best chance of success in making products safer.

Industry also has access to domain expertise and a real-world environment for industry trials and evaluation, as well as the ability to contribute shared data about products and players. This is particularly important in an industry where change is constant and unpredictable and technological innovation exists on a steep gradient. Given this change, industry should not always wait for regulations to be established, the process of establishing them is typically lengthy whilst the rate of technological and gambling product innovation is much faster. Codes of conduct can be actively adopted by to help raise standards quicker and adopt

Figure 1
The gambling industry as a constructive stakeholder in a whole systems approach.



innovation. This is in contrast to more stable regulations and ongoing compliance monitoring, such as certification.

The need for strategic integration applies also to strategies and not simply stakeholders. In the UK, for example, one of the current challenges is that multiple, concurrent new approaches have been proposed to reduce unaffordable losses incurred from gambling (All-Party Parliamentary Group for Gambling Related Harm, 2020; Noyes & Shepherd, 2020): (1) limiting stake size (i.e., a product restriction) and (2) imposing spend limits of £100 per month until evidence of customer affordability can be confirmed—that is, a surrounding safeguard. If the latter affordability measure were to be adopted, it is not immediately clear what additional benefit would be gained by reducing stake size, despite the significant implications and resource requirements related to implementing both options.

Assessing product risk

At the time of writing the present article, in late 2020, there had been significant deliberation regarding the rating of products according to the different levels of risk posed. Among those giving consideration were politicians in the UK (House of Lords Select Committee on the Social and Economic Impact of the Gambling Industry, 2020), and in Sweden (Statens Offentliga Utredingar, 2020), and regulators in the Netherlands (Kansspelautoriteit, 2020). Product risk classification has also been called for by certain charities (e.g., Gambling with Lives; see House of Lords Select Committee on the Social and Economic Impact of the Gambling Industry, 2020) and certain academics (Noyes & Shepherd, 2020; Orford, 2019). It is argued that a classification system would make the different levels of risks posed by products more transparent to consumers; this also extends to gambling providers and policymakers, who could this information to better inform player protection policies (Statens Offentliga Utredingar, 2020).

Currently, however, there is no universally accepted approach for risk assessment, although gambling product risk protocols do exist. There are, for example, commercial and proprietary products such as *GAM-GaRD* as well as open (no-cost) tools such as ASTERIG (Blanco et al., 2014) and the tool developed by Meyer and colleagues (2011). As an open access tool we can describe the purpose of ASTERIG, which is a framework that provides guidance for rating the risks associated with 10 common game properties (e.g., event frequency, payback interval, jackpot size), which are then weighted and aggregated to give an overall estimate of risk for any given game. However, there are limitations to the ASTERIG's approach including: (1) its reliance on invalid and poorly defined risk criteria; (2) its lack of precision and sensitivity in its scoring methods, and (3) its omission of important structural risk factors, such cost of play (see Parke & Defabbro, 2020 for a full review). As Parke and Delfabbro point out, one of the principal limitations of these tools is that they are often based on expert-opinion refined using Delphi techniques rather than validation against other empirical evidence. Thus, it is not uncommon to find that these tools yield results that do not appear to match empirical evidence concerning

the relative risks of products as based on major comparisons of problem gambling rates or harm associated with different product types. For example, the Meyer et al. (2011) instrument reports that retail (not online) scratch cards are a moderate risk product that are almost as risky as casino table games, despite consistent evidence form a number of major studies (e.g., Afifi et al., 2010; Binde et al., 2017; Brosowski et al., 2020; Castren et al., 2018) which demonstrate that lottery products are rarely associated with harm. Another issue is that one does not know whether to score criteria based on the behaviour of the average player, high risk gamblers, or the worst possible scenario (e.g., assuming that a person can play scratch-cards continuously for several hours requiring the advance purchasing of scratch cards[17]). Notwithstanding their limitations, ASTERIG and other tools have been useful for stimulating research and policy in this area. Moreover, particularly relevant to this discussion, the shortcomings of existing tools are, to some extent, reflective of the paucity of extensive testing or validation that accompanied protocol development.

Towards a framework for safer product design

An effective, efficient and fair framework to guide safer product design as well as the regulatory response needs to be informed by several key principles: (1) there needs to be the agreement of clear objectives; (2) there is a focus on outcomes; (3) decisions are based on an inclusive appraisal of valid and reliable evidence; (4) there is strategic integration of policies, practices, knowledge, roles and responsibilities through adopting a "whole systems" approach to public health; (5) leaders in the field engage beyond their own organisations and stakeholder groups; (6) there is a shared understanding of what is meant by product risk and the product characteristics or features that are related to risk; (7) there is collaboration between stakeholders or a balanced appraisal and sharing of stakeholder perspectives to allow decision-makers to understand the impact of product risk; and (8) there are valid and reliable protocols for assessing risk that are recognised by different stakeholders.

Principle 1: Clear objectives

If shared goal of stakeholders is reducing gambling harm, the first component of a product risk framework is understanding and agreeing on the objectives to make that happen as effectively, efficiency and equitably as possible. In current public health contexts and for many stakeholders (government, welfare groups or academics), there may be singular objective to reduce the risks associated with a particular product. For the industry which designs, distributes or supplies the products, there will be a need to balance competing objectives: the need for innovation and new product development; commercial or financial performance; customer satisfaction and complying with their conditions of licence. An example of a clear and

[17]Such a situation would be unlikely because (1) pre-committing how much to spend on gambling is likely to be a protective factor against harmful play (Ref) and (2) people may be reluctant to buy a particularly large number of scratch cards in retail settings because of the well-documented concerns among gamblers around stigma and their strong preferences for discretion—e.g., see Hing et al., 2016).

acceptable, albeit complex objective might be to identify product designs, product mixes or contexts that appear to be enjoyable for customers, but pose fewer risks to players. Similarly, agreement might be reached that greater protections and monitoring needs to be put in place where products or their characteristics pose greater risk.

Principle 2: An outcome focus

An outcome focus means that stakeholders do more than measuring their achievement based on what they have done. Instead, the focus is extended to determining whether the change made a difference or contributed to the overall goal (e.g., reducing harm), and if not, what learning can be drawn to improve future strategies. For regulators or government, this may translate into outcomes such as demonstrating a reduction in the percentage of higher risk gamblers reporting difficulty with particular product or mentions of the product by people in counselling or contacting help-services.[18] For the industry, outcomes could be operationalised in terms of adjunct indicators of harm: reductions in the proportion of users of a particular product that seek self-exclusion; who display high risk patterns of play as indicated by risk-identification algorithms; or who show financial distress (declined payments). Such outcomes should indicate the effectiveness of the product modification (i.e., extent to which products are safer), but also be efficient (the benefit of the cost should appear to outweigh the cost) and not give rise to any unintended consequences (e.g., people migrating to a less regulator operated or product).

Principle 3: Decisions informed by acceptable standards of evidence

Agreeing principles for commissioning, compiling and applying research findings may be one of the most challenging but one of the most critical requirements for progressing a product safety strategy. This does not necessarily require that industry research or data be accepted at face value. Instead, there are potential models whereby industry may agree to work with researchers who are able to publish the findings independently, without constraint and adopting principles of open science (e.g., making datasets publicly available or pre-registering research questions and approaches). Alternatively, the industry may provide or share data that enables researchers and policymakers to do the analysis themselves. In this way, accusations of a lack of transparency, obstruction and procrastination can be reduced. At present, limited knowledge sharing of this nature appears to be taking place and this may reflect the mistrust and competing incentives discussed earlier in the paper. For example, the gambling industry may have concerns that activists will pay selective attention to negative findings which align with their interests, while activists may fear industry will only attend to positive findings. Knowledge transfer generated from the trialling and evaluation of safer gambling strategies by industry is particularly

[18]We acknowledge here that this may not always be easy to achieve if new forms of gambling / new platforms are emerging over time. A more modest achievement might be to show that the harm associated with a particular product type has reduced because of some regulatory change.

important. This is because such findings are not usually published, and they reflect real gambling conditions.

Principle 4: Strategic integration of knowledge, policies, practices, roles and responsibilities

A strategic framework for product safety is likely to sit within a broader safer gambling strategy which may also include initiatives addressing responsible marketing and advertising, affordability, risk detection and intervention among customers. Components of a broader safer gambling strategy should take account of the *whole system* and be strategically integrated. In the example of stake size and spend limits outlined above, the strategic integration of both methods should be clearly demonstrated to show principles of effectiveness, efficiency and fairness have been taken into consideration.

Maximising value from the collective skills and resources available from the full range of stakeholders is also important. Referring back to the previous Fixed Odds Betting Terminals example, the money invested by the ABB into a nationwide player protection programme, that was ultimately unsuccessful in averting staking restrictions on their products, could have been invested in a more productive way that would align with all stakeholder interests. Aligned activities to make gambling products safer are more likely to be more effective and efficient. But this requires trust, collaboration between parties, and the capacity to develop research evaluations in a timely and efficient way that meet the requirements of academic publishing, independence and transparency.

Another relevant set of principles and literature that could inform the better strategic application of knowledge about product design relates to theories of change. A "theory of change" outlines and justifies how a strategy will be advanced and provides an early blueprint for action (De Silva et al., 2014). Developing a theory of change requires a significant investment of time upfront but also throughout the implementation of product safety strategy. However, such investment is likely to be worthwhile, as a theory of change provides a basis for ongoing evaluation of the failures and successes of the strategy.

Principle 5: Whole system leadership and thinking

For each of these principles (e.g., agreeing goals, aligning strategies, working collaboratively), to come together, it will be necessary for leaders to engage beyond their respective organisations and stakeholder groups to provide direction. The foundation of such co-operative leadership would start with pledging commitment to a shared vision (i.e., more enjoyment from products, fewer associated harms), underpinned by agreeing more specific objectives (i.e., understand links between products and harm, generate evidence, determine effective and efficient mitigation approaches) and then executed through the allocation of roles and responsibilities which play to stakeholder strengths.

Principle 6: Shared understanding of product safety and risk

This principle sits at the heart of the emerging framework, and while it may underpin other principles it is worth emphasising on its own. For effective reforms and safer product designs, it is important for stakeholders and, in particular, decisions makers such as regulators to have access to the right information and understanding of product risk. In other words, what is meant by product risk, as we have defined it above; what products or features appear to contribute to greater risk; and what evidence is needed to confirm this and to evaluate the results of reforms. This shared understanding requires that acceptable standards of evidence is available in a form that is comprehensible and informative for different stakeholders—not just those in academia. Thus, while the knowledge translation and application principles are important, there needs to be mechanisms in place to build a shared understanding across stakeholders who, as we have outlined above, often have different motivations, skills and knowledge. Establishment of this shared understanding comes from having a clear sense of goals, a shared and agreed understanding of product risk, a respect for evidence, and a common reference point or framework. In concrete terms, a person who wanted to know about product risk should have some reference point: a place where they could obtain details on the concept of product risk, what is already known, how it integrates with other harm minimisation policies or practices, and how reforms are best approached (stakeholders involved, evidence needed, the need for outcomes).

Principle 7: Collaboration between stakeholders

One of the principal challenges associated with this area is how to achieve collaboration between different parties. In essence, this requires mutual respect, exchanges of information and communication between the principal stakeholders. However, for this to happen, different parties will need to be willing to share information (e.g., industry data made available), acknowledge different perspectives and be willing to engage with parties with whom they might not agree. We believe that there are several stages to developing this engagement. First, there is the need to create greater trust. For example, industry must be willing to be more open to questions, transparent about their interests and provide tangible evidence of changes. Second, there should be greater willingness of industry to allow its operations to be open to independent evaluation (e.g., how well is it protecting vulnerable gamblers and evidence for improved outcomes). Third, there needs to be greater tangible and accessible information about how the industry can make a contribution to wider knowledge about gambling and how it is responsive to concerns. Certain important strategies include: (1) engagement with open forums that give other stakeholders opportunities to express their concerns and ask questions; (2) Delphi-techniques in which views around certain propositions (e.g., risks of certain gaming features) are analysed by different stakeholders in a series of iterations; (3) reporting of industry findings in a way that allows independent scrutiny and review—e.g., peer review; or (4) setting up independent and impartial bodies or councils that facilitate the engagement of different parties.

Principle 8: The need for valid and reliable product risk assessment

In addition to the broader strategic and policy issues is the practical matter of how to assess product risk and classify products. How does one determine whether a particular product poses a greater risk of harm than other products? This issue is important because it could provide a consistent reference point for different stakeholders, more objective evidence, a focus point for policy interventions or further research and be used to inform consumers. However, it is recognised that constructing and targeting the most promising methods to mitigate product risk should ideally be informed by identifying the source and magnitude of those risks.

In Table 2 we outline preliminary factors that would need to be considered to develop effective product safety assessments. Consistent with the themes or principles we have outlined above, we believe that effective protocol development should be based on evidence, use clear definitions, be theoretically grounded and be sensitive to variations in product design. For example, concepts such as continuity seem to be confused or collinear with event frequency and variable and multi-stake criteria, often both included. Certain dimensions of risk do not appear to be logically related to risk (e.g., a high or low payback percentage could be a risk factor: one creates incentive, the other greater losses). Certain criteria are not well calibrated (e.g., Meyer et al., 2017 propose a top event frequency of less than 15 seconds—which is too blunt to capture the significant differences that would exist between a less than 1 second reel speed and 5+ second reel speed on slot machines). In our view, further detailed work needs to be conducted into the nature of standardised risk assessment with a greater focus on theory, empirical evidence and validation: do product risk assessments map to differences in behaviour and harm associated with different products, games or features?

In addition to the design principles associated with protocol development are issues associated with use of such protocols. Two important issues are: (1) collaboration and sharing of information and (2) the training and qualifications of those who conduct the scoring. In relation to the first point, we argue that, where a collaborative approach can be fostered, past examples of risk assessments could be shared among stakeholders for guidance and used as basis for long-term development. This approach can also foster fairness by ensuring risk assessments are being applied consistently across providers, although we acknowledge that this relies heavily on adopting a range of principles identified elsewhere in this paper such as managing stakeholder conflicts and achieving agreement on other matter. One useful strategy might be to create a repository of risk profiles with open access granted for research, development and benchmarking. The second issue refers to the need for agreement regarding who should hold responsibility for risk assessments and which principles should be adopted. We suggest that assessors should, as a minimum requirement, be able to demonstrate: (1) independence; and, (2) an adequate knowledge of the potential relationships between structural characteristics and gambling harm. It is also important that assessors must be available given that

Table 2
Important considerations for developing a risk assessment protocol

Consideration	Explanation	Example
Evidence	As stated throughout this paper, the over-arching principle that should guide product risk assessment is that its development should be guided by empirical evidence. Where such evidence is lacking, it should at least be guided by a sound theoretical framework, from which any applications should be evaluated on an ongoing basis. We argue that this is currently the single greatest barrier to developing a valid and reliable protocol for assessing product risks.	The impact of cost of play—i.e., financial loss—as a risk factor is clear yet is not prominently featured in existing risk assessment protocols. While there exists almost no directly relevant evidence regarding the role that game volatility plays in influencing gambling behaviour, there does exist reasonable theoretical basis for its consideration as a risk factor. Evidence regarding the role of near wins and LDWs remains more questionable.
Clear definitions	The specific dimensions of any element of product risk should be operationally defined. Examples of what it is, and what it is not, should be included within this definition. Definitions should seek to minimise the scope for subjective interpretation. Clearly defined risk criteria will minimise disagreement among stakeholders with competing interests.	The interpretation of whether a game outcome constitutes a near win could be highly subjective. For example, does getting 2 numbers of out 6, on a lottery ticket, constitute a near win?
Theoretical rationale	Clear explanations and justifications, supported with empirical evidence where possible, should be provided regarding how it risk is caused. If this is not possible, its inclusion as a risk criterion should be reconsidered. This not only inspires confidence in the rating procedures, but also guides scoring.	It would not be sufficient to say, if game has lights and sounds, it is likely to be riskier. Instead, the precise way in which lights and sounds increase risk should be clearly explained—e.g., where sounds mislead players regarding gambling outcomes.
Sensitivity	Scoring should be sufficiently sensitive to distinguish between various magnitudes of risk. Categorical and dichotomous scoring should also be avoided.	When assessing the risks posed by the speed of game, an upper bound of 5 seconds—i.e., the highest magnitude of risk—for example, may be unlikely to be sufficiently sensitive to detect differences in risks between the fastest games. Research suggests that increases in speed of less one second can elevate risk (Mentzoni et al., 2012).

considerable task of regularly assessing games and features given that in certain cases, operators may have over 1000 games.

It is important to acknowledge that any attempt to reduce the risk associated with products has to be interpreted within the context of a broader suite of other strategies and cannot be seen as a complete solution to reducing gambling-related harm. A danger with too strong a focus just on product risk is that it can lead to the expectation that: (1) doing something will solve the problem; and (2) individuals are somehow protected from harm by offering safer products. In fact, individual action still remains important, so other protections are required. Certain of these important and related strategies are outlined in Table 3. Thus, while product or platform-based interventions might focus on banning or limiting products, certain features or changing parameters (e.g., limiting bet sizes), risk may also be reduced by providing appropriate consumer education, avoiding misleading advertising, educating the industry, and introducing safeguards or protective tools, such as mandatory spend or affordability limits, that might minimise the harm for vulnerable gamblers. What matters is the overall mix of features and interventions that shape the level of risk playing environment and experience, rather than necessarily individual features. For instance, there may arise two features that are identified as small-scale drivers of risk, such that a game may be acceptable with either one of the features but not both.

One of the important issues which is evidenced in Table 3 is the fact that product modifications and safe-guarding strategies are not mutually exclusive, but complementary strategies. Both are, however, informed by an analysis of product risk. A clearer analysis of product risk is essential to examine whether there is a justification in modifying or removing products or games, but it also assists in determining where greater safeguards may need to be applied. This is important because product changes can be complex, expensive and require time for evaluation.

Safeguards, on the other hand, can be implemented more quickly and may potentially be better targeted and individualised to specific products or games. In effect, products can be made safer, not by removing the risk factors, but by introducing other features, such as limits limits, controls, and predictive algorithms that tailor interventions to particular players or which enable players to avoid risks more effectively) (Auer, Hopfgartner et al., 2019, 2020; Auer, Reiestad et al., 2020; Hoffman, 2014, 2016). Such ideas are often referred to as "digital resilience" (UKCIS Digital Resilience Working Party, 2020). One of the advantages of targeted protection is that it can reduce certain of the unintended consequences of removing products or significantly reducing the playing experience- and this includes a migration to less regulated operators (e.g., Hoffman, 2016), parallel play—that is, people playing multiple lower impact games at once—or people playing longer, but at lower intensity (e.g., if the game was modified to limit stake sizes). However, as noted already, such measures must

Table 3

Strategies for preventing and reducing product risks

Approach	Explanation
Product or Platform modifications*	
Parameter specifications	Specifying safer parameters for certain structural characteristics. This might involve max settings (e.g., max stake size), acceptable or preferred ranges (e.g., RTP), etc.
Banning features	Outright banning and removal of some structural characteristics deemed to present an unacceptable level of risk.
Banning products	Outright banning and removal of some types of games that are deemed to present an unacceptable level of risk.
Other interventions	
Informed consent	Promoting customer awareness on: (1) the nature of products and how they work (game transparency); (2) the potential risks associated with product—e.g., cost of play, volatility; and (3) suggested approaches players can take for mitigating those risks.
Industry education	If those working in the industry are better informed regarding the product risks and opportunities for mitigation, they will be better placed to implement safer designs in products (for software companies) or to respond to product risks within their safer gambling policies (operators).
Strategic safeguards	Improving existing safeguards by configuring and targeting in relation to the level of product risks e.g., limits, controls, predictive algorithms that tailor interventions to particular players or which enable players to avoid risks more effectively
Transparent marketing and advertising	May involve the following components: (1) restrictions on nature, frequency or reach of advertising and marketing; (2) advertising avoid misleading claims about products (3) should provide information about potential products risks

Note. Structural modifications could be applied to either features within the game itself—e.g., free spins or near wins) or the platform in which it is provided—removing reverse withdrawal capabilities. It is also important to note that some parameters are configured by the operator and not the software provider (e.g., auto-play, in game marketing or stake size).

be demonstrated to be effective using the acceptable standards of evidence, to reassure all stakeholders of their potential to mitigate product risks.

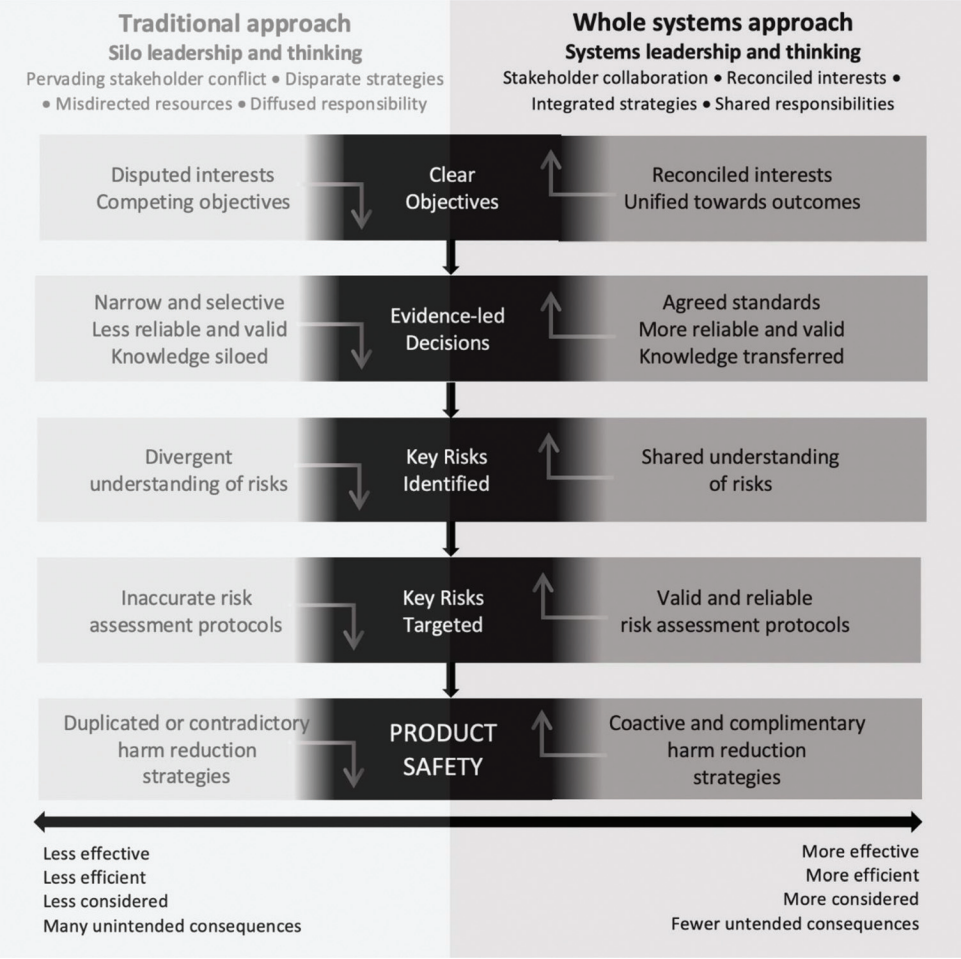
Further, central to the issue of targeted responses, is the need to prioritise. In particular, stakeholders should assess whether there are things which be done in the short-term to make meaningful changes that could be subsequent to ongoing evaluation. Sensible public policy change usually occurs gradually rather than in leaps. Thus, just as the industry can be criticised for waiting for the evidence before reforms are implemented, so too can advocates for reform be criticised for asking for dramatic changes quite quickly—e.g., removal or significant modification to slot machines—without considering the consequences of evidence in favour of the reform, especially given that it can sometimes be difficult to modify regulation once it is in place. Thus, where we find ourselves agreeing with advocates for reform is that there is value in achieving small victories (David et al., 2019); but, as Delfabbro and King (2020c) have argued, care needs to be taken to avoid selecting evidence that supports the reform. Instead, the reform should follow from the evidence, have a justifiable rationale and should be strategically integrated within a whole systems approach.

Conclusions: A collaborative, integrated evidence-based framework for product safety

In this paper, we have explained the concept of product risk, considered the state of existing evidence, and subsequently proposed a number of principles and developments that we believe are necessary for product risk assessment—a common topic of policy reform—around the world to be approached in a way that is more likely to yield meaningful and productive outcomes. A framework for product safety is proposed which brings together the core principles, the stakeholders, and the facilitators of reform.

As shown in Figure 2, achieving a shared goal of developing safer products will require a *whole systems strategic approach* involving an engaged, committed and collaborative *stakeholder group*, with the necessary *system leadership and thinking* in place to reconcile competing interests. Fundamental to accurately targeting harm reduction strategies would be *a shared understanding of product risk*, based on consistent interpretation of *valid and reliable evidence* which would be shared and accepted by all stakeholders. The output of this shared understanding of product risk should be dynamic, valid and reliable *risk assessment protocols*. At a conceptual level, certain insights could be gained from considering developments in Game Theory—e.g., mechanism design—and Token Economics (Dimitrios, 2009; Legros, & Cantillon, 2007), which are innovative areas of economic and policy thinking that examine how the actions of parties might be modified and shaped by a greater focus on incentives, consumer feedback and understanding of externalities. This approach often looks for common outcomes—e.g., the achievement of "public good"—where attempts are made to reverse engineer desired regulatory outcomes (e.g., reducing gambling harm). For example, industries may respond to increasing criticism of their products by being motivated to seek advice from consumers, receive safety

Figure 2
A collaborative, integrated and evidence-based framework for product safety.



accreditations, or reputational or quality ratings based on their actions. Great engagement and genuine commitment to harm minimisation could then lead to both better consumer responses, but also avert onerous regulatory responses.

In conclusion, it is critical that all stakeholders understand that they will have a responsibility to respond to that which emerges from the framework, including regulators, industry, academics and those involved in advocacy and support for those affected by gambling harms, as well as those with an indirect interest—e.g., those responsible for policy in relation to place and population health. Gambling regulators and policy makers will need to work alongside other stakeholders to determine and deliver good system leadership and develop regulatory responses to support safer product design. The industry and academics will need to work together to develop mechanisms and infrastructure which support the implementation of safer product design—e.g., codes of conduct, audit and certification models, trials, data sharing and knowledge transfer. Ultimately, successful mitigation of product risk

will require open, transparent and constructive dialogue between all stakeholders to move most efficiently towards a consumer environment which, by design, maximises product enjoyment but minimises product risk.

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Competing interests: Paul Delfabbo has received funding for research, support for conference travel and speaking engagements from government and non-government research bodies such as AGRI, VRGF, IAGR and the Department of Consumer Affairs, GambleAware/ RGT, Gambling Research Australia, Independent Gambling Authority, the ARC, NHMRC, Channel 7 Children's Foundation and Australian Institute of Criminology. He has conducted paid consultancy work on responsible gambling for regulatory bodies, government, peak bodies such as the Australasian Gambling Commission and reviews of responsible gambling programs for some industry groups—e.g., reviews of list of indicators, self-exclusion program, host responsibility quality in relation to international best practice. He acknowledges that many peak research bodies are indirectly funded by industry through levies or contributions. Jonathan Parke has received support for research, travel and speaking engagements from a variety of government and non-government sources including AGRI and GambleAware. He has conducted a number of commissioned reports for industry groups. The principal focus of this work has been on harm minimization, responsible

gambling and risk associated with different gambling products and features. Simo Dragicevic is founder of BetBuddy, a subsidiary of Playtech Plc. He has contributed research in the areas of gambling products, safer and responsible gambling, and explainable AI. He is a PhD supervisor at City, University of London and a board member of the Responsible Gambling Council of Ontario, Canada. Chris Percy is a data science contractor and independent researcher, with recent projects with the World Bank, the OECD, and the ILO. His work with Playtech and the gambling industry focuses on R&D initiatives to improve the identification and mitigation of gambling-related risk. Richard Bayliss has previously worked in regulation, but is now employed by Playtech as an advisor on matters relating to regulation and product risk.

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