Effective age-gating for online alcohol sales

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Executive summary

In principle, the sale of alcohol to under 18s online is prohibited by law. However, the implementation of measures to prevent such purchases varies widely amongst different retailers. Many companies push the necessary age verification checks to the end of the buying process, requiring delivery drivers to manually check identification and refuse sales as appropriate. This interpretation of the law is often followed by retailers, and has been unchallenged despite its lack of legal certainty.

Current methods of age verification are largely ineffectual. When implemented online, they often involve simple 'honour' checks, which are easily deceived, or alternative forms of 'authentication' that can be bypassed in various ways. Implemented offline, by delivery drivers, etc., they are known to be ineffective in practice. A particular difficulty arises when alcohol is part of a larger online shopping cart, which can often make it 'invisible'.

Introducing technical measures to prevent the sale of alcohol to under 18s would help increase the safeguarding of minors, reducing the possibility of obtaining alcohol online and bypassing existing checks. Despite several emerging technologies and promising developments in other domains such as online gambling and pornography, the simplest and most effective measure could be to extend the use of Merchant Category Codes (MCC codes) to repurpose banks' existing identity and age verification checks.

This report makes the following specific recommendations (in regard to the online purchase of alcohol by under 18s):

1. The law must be clarified
2. No confidence should be placed in existing safeguards
3. Items within online 'shopping baskets' should be considered individually
4. The use of MCC codes and bank authorisation processes should be extended
5. Relevant emerging technology should be continuously monitored

Introduction and research context

The source of this research is a background of uncertainty – across various stakeholder groups – regarding the ease with which those under 18 years old in the UK can currently obtain alcohol by purchasing it online and, conversely, the appropriateness of online 'age-gating' (*AG*) or 'age-verification' (*AV*) processes to prevent this. Our starting definitions of 'purchasing alcohol online' are intentionally loose and cover any process by which a transaction to buy alcohol is completed over the Internet, with the alcohol itself (usually) being delivered to a home address or other private or protected location.

There is already some awareness of this issue, but also confusion. A 2012 report, on behalf of *Serve Legal* [1], noted that, *'on-line sales pose a serious threat due to the nature of the internet and the difficulties we have in policing it,'* whilst the following year saw the publication of a larger study [2], funded by the gambling industry, noting, *'There is no definitive answer as to what constitutes taking "all reasonable precautions" [in regard to "effective systems" of AV] or exercising all due diligence.'* (A discussion on the legal situation regarding alcohol in England and Wales follows.) Moreover, by this time there were already conflicting academic views on the likely effectiveness of AV in different online environments [3] [4]. This is a broad, and in places unclear, field requiring a small-scale study such as this to identify clear foci. Consequently, some essential baselines for this research study are identified as follows.

The emphasis of the research reported here is specifically under 18s attempting to purchase alcohol online within the UK. However, in addition to assessing the effectiveness of UK AV processes for online alcohol sales, this research considered wider solutions in:

- other countries across Europe and beyond;
- other domains and industries such as gambling, pornography and weapons.

This wider view included examples of good practice elsewhere and the potentially more effective use of technologies either already in use or readily available. Although it can be easily recognised that different legislation applies in different countries and across different industries, in the UK the principle of *proportionality* is often claimed: the application of more stringent AV processes in line with more serious perceived risk to the child (or others). However, in practice, it may be that the effort actually devoted to effective online AV may have more to do with the perceived reputational risk to the company or financial loss or penalty. This was a recurrent feature in various discussions and investigations and is relevant to some of what follows.

This research does *not* consider cases where an adult deliberately and knowingly purchases alcohol to give to a child. Although there are situations in which this is entirely legal, and where it is not, this is to be considered an altogether different problem requiring a solution on an entirely different social level. There is little

practical difference between the online and offline case when this secondary supply is both illegal and intentional. However, for online purchases, a range of more moderate situations must be recognised in which an adult facilitates the acquisition of alcohol by a child through negligence, incompetence or lack of technological awareness or expertise (for example inadequate privacy settings or an under 18's access to a parent's credit card, online accounts, orders or payments.). Figure 1 shows some typical examples.
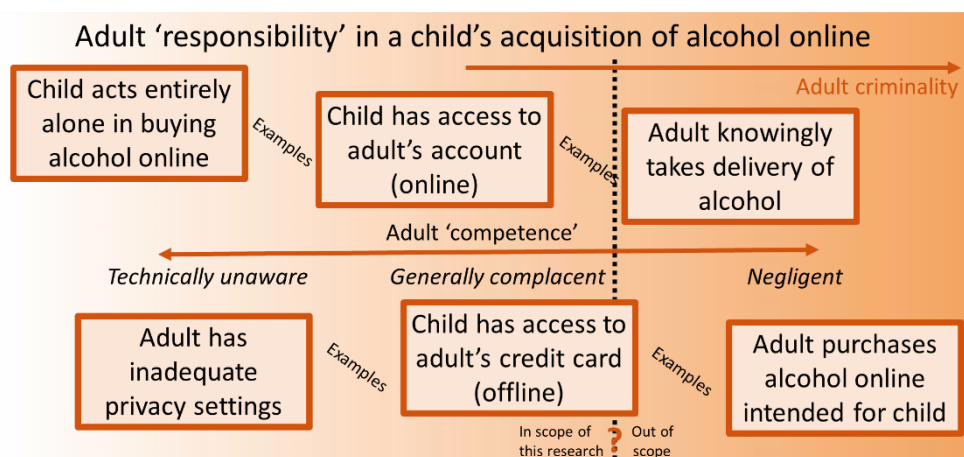

Figure 1. Adult responsibility in a child's acquisition of alcohol online, identifying situations within the scope of this research.

The 'in scope' limit, however, is almost impossible to define precisely or in practice.

One final – but very significant – assumption, broadly applied in what follows, is that any system of online AG that relies on AV at the point of delivery (i.e. by a delivery driver) is inherently ineffective. Earlier studies suggest a 'compliance rate' in this respect of less than half in test cases of deliveries being made to – or ordered by – under 18s. Delivery drivers are often employed on zero-hours contracts and working to tight schedules and the situation is made even worse for deliveries under plain wrapping by a third party courier (even conventional post) entirely unaware of the contents of each package. This has been demonstrated by previous research in the UK [5] and elsewhere [6] and has recently been the subject of media interest [7].

An attempt to establish the exact legal situation with regard to online AV for alcohol purchases follows.

The legal situation in theory and practice

Although not a central thread of this research, a brief discussion of relevant legislation in England and Wales, and its current interpretation, is necessary here, not least because selective interpretation of some legal wording appears to play a role in the confusion that has arisen. This is exacerbated in part by the need to combine and apply elements of legislation relating to both alcohol *sales* and *licensing*.

Aims and intentions are clear and brief. The *2003 Licensing Act* [8] has, as one of its (Provision 4) objectives, *'the protection of children from harm'* and the 2015 Home Office policy paper on alcohol sales [9] states clearly (Appendix 2) that, *'Selling alcohol to anyone under the age of 18 is illegal in England and Wales'* (with some exceptions that do not apply here). Methods of effective AV for physical purchases of alcohol are discussed robustly throughout and elsewhere.

The difficulty arises when this legislation is applied to online alcohol sales; in particular in relation to the point at which a sale *happens*, and is *completed*, and, by inference, a definition of *by when* AV should presumably have taken place. (2003 was a relatively early stage for Internet retail.) Although Section 190 of the 2003 Act [8] defines that *'the sale of alcohol is to be treated as taking place where the alcohol is appropriated to the contract'*, and the 2017 Home Office guidance notes [10] (Section 3.9) clarify further that:

> *'The place where the order for alcohol, or payment for it, takes place may not be the same as the place where the alcohol is appropriated to the contract (i.e. the place where it is identified and specifically set apart for delivery to the purchaser). This position can arise when sales are made online, by telephone, or mail order… It will be the premises at this location which need to be licensed; for example, a call centre receiving orders for alcohol would not need a licence but the warehouse where the alcohol is stored and specifically selected for, and despatched to, the purchaser would need to be licensed…'*

Section 10.50 of the same document, however, offers the further, intervention of:

> *'Licence holders should consider carefully what steps they are required to take to comply with the age verification requirements under the 2003 Act in relation to sales of alcohol made remotely. These include sales made online, by telephone and mail order sales, and alcohol delivery services. Each of these sales must comply with the requirements of the 2003 Act. The mandatory condition requires that age verification takes place before a person is served alcohol. Where alcohol is sold remotely (for example, online) or through a telephone transaction, the sale is made at this point but the alcohol is not actually served until it is delivered to the customer. Age verification measures (for example, online age verification) should be used to ensure that alcohol is not sold to any person under the age of 18.'*

The document continues,[1]

> *'However, licence holders should also consider carefully what steps are appropriate to ensure that age verification takes place before the alcohol*

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[1] This single paragraph in the original document is split here for ease of discussion.

is served (i.e. physically delivered) to the customer to be satisfied that the customer is aged 18 or over. It is, therefore, the responsibility of the person serving or delivering the alcohol to ensure that age verification has taken place and that photo ID has been checked if the person appears to be less than 18 years of age.'

The second part of Section 10.50, particularly its arguably vague *'should also consider'* is open to interpretation. It can be legitimately interpreted as, whilst *appropriation* occurs as goods leave (for example) the warehouse, AV on delivery may be considered an *acceptable proxy*. However, it can also be interpreted more strictly as AV being required at *both* the online transaction stage (i.e. before the *transaction is complete*) *and* subsequently on delivery (i.e. before alcohol is *served*). There appears to be no newer clarification available[2]. Unsurprisingly, whilst many online suppliers have chosen the convenience of the former interpretation, emergent specialists in online identity authentication, looking to promote their services, have preferred the latter: *'Websites offering age-restricted goods and services are now legally required to check the customer's age eligibility before entering into an online transaction with them.'* [11]. This may be an excellent principle but it is not manifest that the law says this.

Even if nothing else changes in relation to online AV in the immediate future, this anomaly must be clarified.

Research design and methodology

This project started on 20 January 2020 and reported on 17 April 2020. Ethical approval was granted by the university's ethics committee on 4 February 2020. With less than three months to complete, some tight structures and processes were needed from the outset. The project was thus organised as six brief work-packages: (1) Desk-based literature search, (2) Student pilot study, (3) Interviews/discussions with key stakeholders, (4) Desk-based internet exploration, (5) Consideration of results and recommendations and (6) Report writing; arranged as in Figure 2.

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[2] Although [5] notes, "Licensing Act 2003: Section 151 (1)(a) A person who works on relevant premises ... commits an offence if he knowingly delivers to an individual aged under 18 alcohol sold on the premises BUT (4) The above does not apply where – (a) the alcohol is delivered ... where the buyer ... lives (to illustrate, where a child answers the door and signs for the delivery of his parent's order at home, no offence has been committed under Section 151", the assumption is that the *initial purchase* is legitimate – i.e. made by an adult. If this is not the case then an offence has *already* been committed earlier in the process.
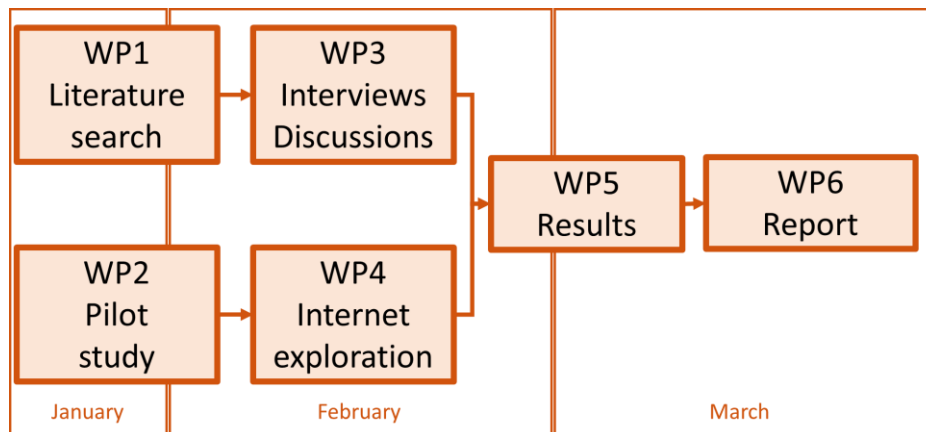
Figure 2. Research structure identifying the six work-packages.

The literature search (academic, commercial and media) and the pilot study (next section) provided rapid direction and focus for the remainder of the project. In particular, it identified key lines of enquiry for both talking to key stakeholders (Appendix) and online research and experimentation. As part of the latter, some trivial preparation was involved: the setting up of bogus online identities, purchasing a pre-paid credit card, etc.[3]. Once all the material had been collected and collated – so far as time allowed, there was a brief period of analysis, then formulation of recommendations, before structuring and writing the final report.

Most parts of the project went well. Existing material concerning alcohol and other age-restricted goods in the UK and beyond, though not copious, presented a fairly consistent picture, even if that consistency recognised a level of confusion at its heart. We were given excellent support, knowledge and advice from some very experienced individuals in appropriate fields. We were, however, frustrated at times by considerable reluctance from representatives of the relevant wider industries to be contacted. There was perhaps a suspicion of a 'name and shame' threat, which was never the intention.

Student pilot study

It was immediately clear that working *directly* with under 18s (children) would prove problematic: ethical approval alone might take longer to obtain than the project itself. However, a convenient supply of individuals with *recent experience of being under 18* was obviously available.

A number of student focus groups were quickly formed, primarily from Glyndŵr 'foundation year' degree programmes (the earliest stage of any higher education programme) across a variety of subjects. Not all students had come directly from school/college and the classes contained some 'mature students' (defined in this

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[3] All research methodology was approved by the university Ethics Committee

context as being over 21). Also, it must be recognised that university students are not necessarily representative of the younger population across the country (although Wrexham Glyndŵr University has been top of the *Times and Sunday Times Good University Guide* for 'social inclusion' in the UK as a whole for the past two years [12]). However, even recognising the sample bias for what it was, this allowed some very useful information to be gathered quickly.

Sessions were delivered as part of the obligatory foundation year *'Contextual Studies'* module, in which younger, newer students are expected to broaden their horizons beyond their chosen subject discipline. The tendency for 'volunteer bias' was thus reduced by using such 'captive' groups. Discussions took place as a class and broken into smaller 'table' units. The confidential and anonymous nature of the sessions was stressed throughout. A questionnaire (Appendix) was distributed at the start of the session and collected in at the end. It was ensured that *all* questionnaires – including those with 'nothing to report/say' – were returned to eliminate 'response bias' as much as possible. Discussions (Appendix), and questions considered on the questionnaires, broadly covered:

- Personal experience of under 18s obtaining alcohol online;
- Second-hand knowledge of under 18s obtaining alcohol online;
- Awareness of current mechanisms for online AG/AV;
- Effectiveness of current mechanisms for online AG/AV;
- Emergent and future technologies

In total, 93 students took part and returned questionnaires. The results of group discussions and questionnaire responses aligned considerably and can be summarised as follows:

- *Existing online AG/AV processes are far from adequate*:

  Those intent on buying alcohol as under 18s experienced little or no difficulty in doing so. Explanations/descriptions (some edited slightly for clarity/brevity) included:

  - "Amazon online - no ID - DoB only"
  - "Pre-paid credit card"
  - "Online Tesco's shopping; delivered; no ID check"
  - "Lied about age on collection"
  - "Many cases - no verification"
  - "No ID needed"
  - "Lied about age; no ID check"
  - "Websites just asked for DOB or if you're over 18"
  - "Ordering off Amazon; delivery driver just dropped off - minor not at home"
  - "Adding alcohol onto Mum's weekly delivery without her realising"
  - "No ID check from Amazon"

- o "Ordered on Amazon and ASDA Online; no ID check at purchase or delivery"
- o "Amazon account was someone's over 18; signed for by someone else"
- o "Ordered off Amazon with Dad's credit card"

- *There is a relatively low, but non-negligible, rate of exploitation of these current shortcomings*:

  - o 8% of students reported having themselves purchased alcohol online as under 18s, while 12% knew of others who had successfully done so. Overall, 16% of students had either done this themselves or knew someone who had.
  - o These 'incidents' were uniformly distributed over the period 2010-2020.

Two common patterns behind the second observation would seem to be that, if so minded, under 18s have more convenient routes than the Internet to obtaining alcohol (such as older friends, family and shared environments), and that there is a perceptibly changing attitude towards drinking among the younger population, with more young people abstaining from alcohol. Both of these could change, of course, with unchecked emergent technologies perhaps making online purchasing even easier, or with ongoing variations in youth culture.

A particular theme, and one that recurs throughout this research, would appear to be issues surrounding the purchase of alcohol as part of a larger order – general groceries, for example – either by an under-18 or an adult.

Although limited significance is to be placed on a relatively small, potentially biased set of results, these did provide useful direction for subsequent interviews with relevant stakeholders and deeper technical research, described as follows.

Current solutions and their effectiveness

We now turn to the results of desk research and interviews with key stakeholders. The latter discussions covered broad questions given in the Appendix. The former included experimentation with real online alcohol suppliers, retailers and distributors; conventional and electronic payment systems, pre-paid credit cards; and real and imaginary/invented online personas.

Most online systems appear to implement some measure(s) to attempt to prevent the sale of alcohol to minors. These current solutions can be grouped into four main categories, each of which is discussed below.

Statements of self-confirmation

The most basic measure used by websites is the self-confirmation statement. With this technique, the user is shown a statement either on the page or as a modal

window that must be ticked prior to an order being placed. An example is shown in Figure 3.
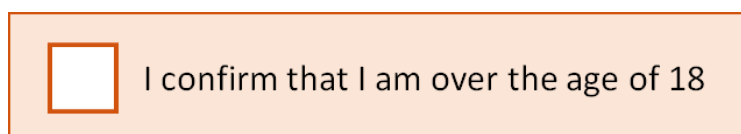

Figure 3. Example of self-confirmation interface.

This interface is simple for developers to implement. However, it assumes that users will be truthful and honest when ordering alcohol online. There are often no further checks that the user is over the age of 18. Such an approach lacks robustness of any kind entirely.

Date-of-birth entry

The second type of interface asks the user for their date of birth, and performs a check that the date entered is within the permitted age restrictions. An example of this interface is shown in Figure 4.

Although this type of interface nominally suggests a form of authentication, it still clearly relies on the honesty of the user, and only provides the most trivial of checks, which can be bypassed easily by a minor calculating an appropriate date of birth. This does not provide sufficient checking that the retailer can confidently confirm that the person ordering is above the appropriate age restriction and, in practical terms, is no more robust than the previous type.
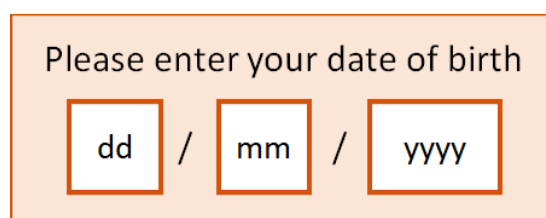
Figure 4. Example of date of birth entry.

Credit card only

Under the terms of the Consumer Credit Act 1974 [13], under-18s are not permitted to sign up to credit agreements such as credit cards. As this age is equivalent to that required for the purchase of alcohol in the UK, some retailers use payment via credit cards as proof that the user is over the age of 18. Whilst this is generally true, there are clear circumstances where under-18s can obtain and/or use such credit cards.

For example, it is possible for an adult to present an under-18 with a legally held credit card in their name where the bill is paid by an over-18. In this case, the use of a credit card cannot be used robustly as a proxy for age, although the retailer has no mechanism to detect if this is the case. The same applies to any service such as UberEats that only allows those over the age of 18 to create accounts (whether

purchasing alcohol or not) based on the initial pre-authorisation of a credit card. Anyone could create the account for them.

Over the past decade, the sale of prepaid credit cards (which are preloaded with cash prior to use, and can be obtained with minimal checking) has become more common within retail stores. Launched to allow those without access to credit to pay for purchases online safely, these routinely forbid the purchase of age-restricted products such as alcohol within their terms and conditions. Unfortunately, this is rarely enforced in practice where orders are placed for alcohol along with another purchase: for example in supermarkets or fast food delivery or as part of a gift. Similarly, terms and conditions for pre-paid credit cards often claim that *'[online] registration is required before the card can be used online'*. However, this also appears not to be the case in practice: we successfully made a number of purchases (including alcohol) with an anonymous/unregistered card.

The same methods of verifying age cannot be applied if the purchase is made with a debit card, as these can be obtained by under-18s. Not all websites appear to make this distinction between types of card. Finally, of course, there is no deterrence for those paying cash on delivery, for example with food deliveries.

Checking on delivery

Most supermarket home delivery services 'operate' (or at least, *claim* to) a policy of checking that an order is being received by an over-18 as a proxy to checking the age of the original purchaser. (As previously discussed, whether this is really acceptable in law is unclear.) This has been explored many times by the media over the past decade as a rarely-enforced and easily-followed route for minors to purchase and receive delivery of alcohol [14] [15]. Delivery drivers are instructed to check physical government-issued ID in the same manner as would take place in-store, applying the same policies such as 'Challenge-21' or 'Challenge-25'.

Food delivery apps, such as Deliveroo, take this approach, passing the responsibility onto their delivery drivers. Despite this being presented as an enforced 'policy' for delivery drivers, in practice, the use of casual workers and lack of formal training beyond in-app 'advice' appears to lead to inconsistencies in the way the law is applied. In Deliveroo's case, for example, those who cannot provide appropriate age identification on request forfeit the alcohol in the order, *'for responsible disposal'* by the delivery driver [16]!

Despite becoming a de-facto standard, the law is unclear on whether this proxy is a suitable choice for verification as the Licensing Act regulates the age of the purchaser, not the receiver of the alcohol products. There have been no test cases of such approaches (already known to be ineffective), which is unfortunate since these could be further used to identify the potential issues with delaying checks to the point of delivery.

Summary

The four methods of age verification identified above are routinely used with alcohol sales. As online sales are often seen as a smaller market with lower rates of access and less impulse purchasing, this is often overlooked by regulators in pursuit of the more visible and localised contraventions of the relevant regulations. Many online-only retailers, of course, distribute goods through third-party package delivery services. Where these are used, there can be no mechanisms in place to enforce the relevant age checks on delivery. Therefore, the necessary precautions should be (but often are not) taken at the point of purchase.

Simple extensions to current solutions

Research in other domains such as online gambling, online pornography and the sale of weapons has identified the need to work within existing processes to introduce new measures. Rather than change the entire system, a better approach is to improve and build on current patterns to increase organizational buy-in and societal acceptance. Some possible solutions to enhance online age verification are discussed below.

Token purchase

One solution, proposed in now-abandoned 2019 regulations under the Digital Economy Act 2017, was that individuals would purchase an individual token containing an access code in a physical retail outlet such as a supermarket or corner shop. Appropriate age verification would take place at the point of purchase, with the code being subsequently used to access age restricted content [17]. There is a large emphasis placed on the privacy of the purchaser in such an approach, although by the same mechanism the use of such tokens (including their being passed or sold on) cannot be tracked or re-validated at a later stage, so its ongoing robustness is questionable.

Mobile phone verification

In order to prevent minors' access to adult content, UK mobile operators already apply a blanket ban on such websites, that is only lifted after the owner has verified their age using another process, such as in-person ID checks or purchase using a credit card [18]. Based on these checks, some age verification service providers are able to detect whether or not the filters are applied to a mobile phone using software checks. These enable the provider to use this as a method for verification, relying on the authentication already put in place by the mobile providers.

Each mobile provider has their own policy for how age is verified: many use the existence of a credit card as a mechanism to prove that the owner is over 18 [19] [20], taking a nominal payment that is refunded immediately. The same caveats apply here as for the credit card verification discussed above: there are situations where under-18s may have access to a credit card, there may be details set up on an account already or they could purchase a pre-paid credit card. For those without

access to such payment methods, mobile providers will also lift the content block on production of ID in a physical store, which, again, could limit robustness in the long term (for example if the phone is passed or sold on).

Multi-factor authentication

Recognising that there is no single one-size-fits-all solution, many age verification service providers have developed processes that allow for multi-factor authentication [21]. This means that purchasers would be able to use one of many methods to demonstrate their age, starting with the measures with the least 'friction' (such as electoral role checks), leading to the use of physical ID as an final fall-back of last resort. Using multiple mechanisms solves the issue of purchasers who do not have particular forms of ID or are unwilling to use them online, although it does increase the number of vectors that could be compromised to avoid the verification checks. (Those seeking to purchase alcohol illegally would naturally seek to target the 'weakest link in the chain'.)

Bank authentication

Each payment made online is processed through a bank where the user must have an account. As banks are highly regulated institutions, they are required to thoroughly verify the identity of any account holder through the use of government issued ID and national databases. The data from these sources can be trusted, and the use of the bank's verified data could provide a reasonable means of verifying the age of a card holder.

Using the existing payment mechanisms, a small extension could be made to allow for additional verification of the card holder. This would mean that certain purchases would require the card holder to be over 18, with this being established using a true/false flag within an online purchase (or online shopping basket) to identify whether this is the case. Identifying purchases that require the card holder to be over 18 would be (as now) the responsibility of the retailer, with existing solutions extended to check the presence of this flag.

To detect whether age verification is required, retailers will need to identify whether any individual items within the order are age restricted products. Many retailers already have this data in place (for various age-restricted goods); however, they will need to flag individual items and apply verification as appropriate. A sample flow chart for this process is shown in Figure 5.

No additional hardware would be required for such a system; rather the extension could be written into new software. A relevant flag should be added to stock databases, point-of-sale systems would operate much as before, but with the logic of Figure 5 incorporated, and the additional acknowledgement of age-verification would be passed to/from the bank along with existing financial authentication.
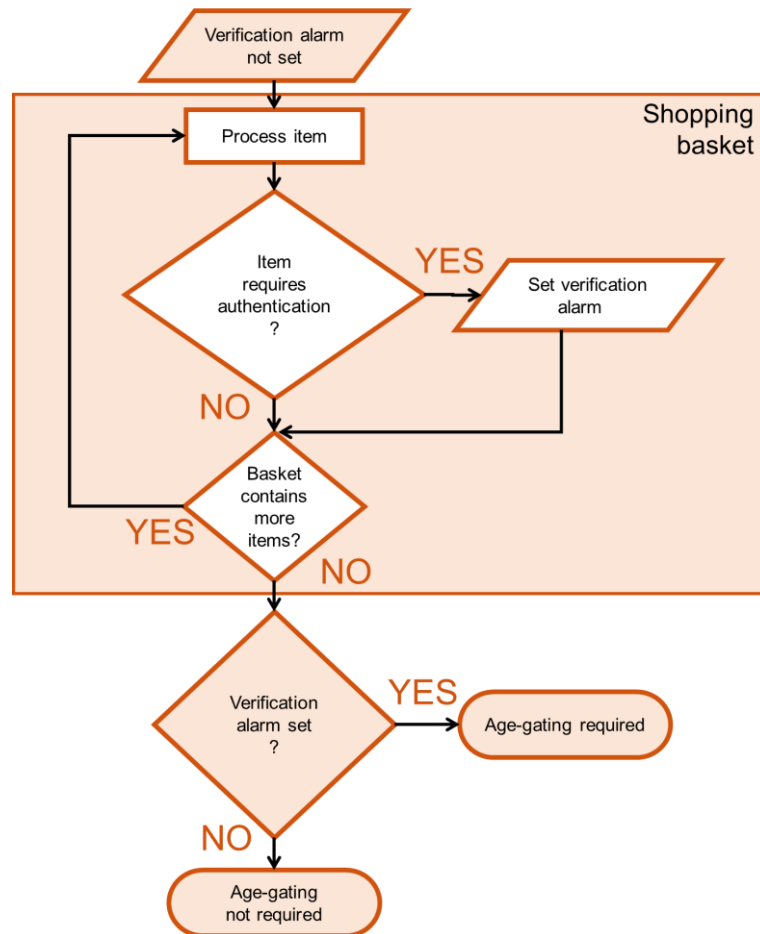
'Fine tuning' an online shopping basket

Figure 5. The process of checking whether an online order requires bank authorisation.

Applying this policy at an international level would require further checks and restrictions based on local alcohol purchasing laws. However, a broad national approach would provide sufficient limitations to reduce the impulse and occasional purchasing likely to be engaged in by under-18s. In addition, many supermarkets and large retailers have already identified age restricted products within their point of sale systems, with this approach providing an extra check beyond those taken by the cashier, giving benefits for in-person as well as online sales.

Type 3 line item data

As the reliance on corporate and government credit cards for purchases increased, organisations demanded new means for tracking individual items for correlation with orders and invoices. To respond to this demand, the payment processors defined three different types of transaction data:

- Level 1 – Only includes basic information, such as the merchant name, date and transaction amount.
- Level 2 – Includes level 1 data, in addition to information about the customer, merchant and tax paid.

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- Level 3 – Includes level 1 and 2 data, as well as including details for every line item in the transaction. This is known as type 3 line item data.

These three levels of data are summarised in Table 1.

Data	Level 1	Level 2	Level 3
Merchant name	✓	✓	✓
Date	✓	✓	✓
Transaction total	✓	✓	✓
Tax amount		✓	✓
Customer code		✓	✓
Merchant address		✓	✓
Shipping addresses			✓
Invoice and order numbers			✓
Item product code and description			✓
Item quantity and units			✓
Freight and duty amounts			✓

Table 1. Information passed from merchant to bank via payment provider for the three levels of transaction processing (based on [22]).

Many merchants still only provide information at Level 1, as the higher levels require more detailed (complex) point of sale systems and databases. However, where this data is provided the risk associated with transactions is reduced, leading to banks offering merchants preferential transaction fees.

This enhanced data provided by retailers could be extended to include either an overall indicator that alcohol is included in the transaction, or information on age restrictions for each line item. Banks could then process this data, check the age of the card holder and verify that they should be permitted to complete such a purchase. However, bank systems would need to be updated with this check, ensuring that it would take place as quickly as possible requiring the deployment of more computing power so that transactions containing age-restricted products are not unduly delayed.

Large businesses will already have systems to provide the Level 3 data required. However smaller retailers often only provide basic information as the accounting overhead and requirement for complex systems is too large for their volume of sales. Requiring businesses to submit Level 3 data would provide many opportunities with the sale of age-restricted products (not just alcohol) but would require the deployment of new systems and processes by a wide range of retailers.

Merchant Category Codes

Banking systems are currently configured with Merchant Category Codes (MCCs) that allow banks to identify the types of transactions that cards are used for. First developed in 1937 by the US government, these codes have become a standardised worldwide as ISO 18245 [23]. Banks already use these codes to identify transactions

made online and for gambling and personal services, in order to protect users from fraud and apply appropriate interest rates – although they were originally intended to indicate higher risk businesses for charging appropriate merchant fees. There are several codes that already apply to retail and alcohol sales, including the selection shown in Table 2.

MCC Code	Description
5411	Grocery Stores, Supermarkets
5811	Caterers
5812	Eating Places and Restaurants
5813	Bars, Cocktail Lounges, Discotheques, Nightclubs and Taverns-Drinking Places (Alcoholic Beverages)
5814	Fast Food Restaurants
5921	Package Stores-Beer, Wine and Liquor

Table 2. Subset of MCC codes used by banks to identify merchant activities.

Although there are separate codes for some merchants where alcohol may be sold (e.g. bars), any supermarket sales are simply classified as a generic 'grocery store' transaction. This means that there is no differentiation between those purchases that include or exclude alcohol, and this is common across the list of codes. MCC codes are designed to describe the purpose of the retailer, not the transaction, however, this has now become an inferred purpose to aid banks' identification of purchases. Expanding this system of using MCC codes could be an easy solution to protect under-18s: requiring merchants to use a special 'alcohol' code when alcohol is included in a purchase. Banks could then prohibit cards belonging to under 18s from purchasing such transactions, without preventing non-alcoholic transactions. This type of limitation is already included with many pre-paid credit cards, with the process known as 'MCC filtering' to prevent abuse by those under-age. This is another 'software only' solution: such 'enhanced MCC' filtering would be integrated into a process similar to that described in the previous section (Figure 5) and updated in Figure 6. Consequently, this extended use of MCC codes, described in this section, will be most effective when integrated with the enhanced levels of bank authorisation described in the previous one.

These codes are also used for debit card transactions, leading to this method of filtering also being applicable for many young people who have a debit card but not a credit card. This may reduce the need for other checks discussed above and provide access to a secure online age verification method, benefitting the many younger people with only a debit card. Debit cards have become the leading method of payment nationally with increasing use [24], yet are essentially unsupported by credit-card-only age verification systems.
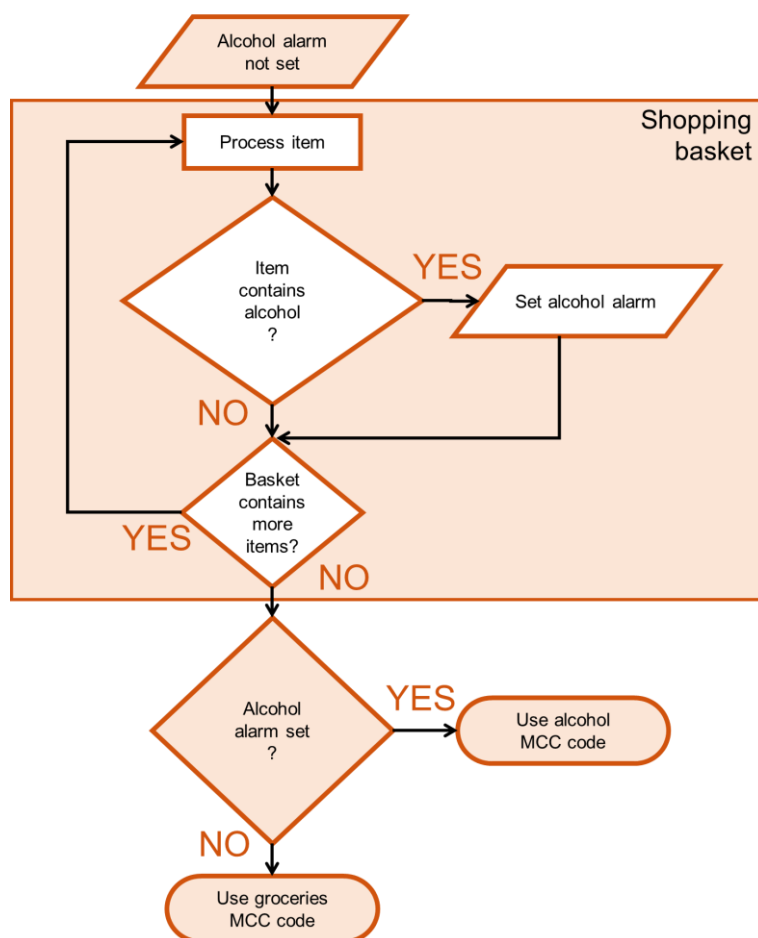
Switching MCC codes on basket items

Figure 6. The process of checking whether an online transaction should have an 'alcohol-related' MCC code.

The use of alternate MCC codes would place the onus on checking whether products are age restricted with the retailer rather than the bank, aligning with the Licensing Act 2003 where the seller is responsible for age verification. This would reduce the complexity for both banks and retailers, as there would only need to be minor system updates using the above algorithm. Retailers would not need to update their systems to provide full Type 3 line item data, making this approach scalable for both small and large organisations. It would also be possible to extend this process for other age-restricted products and internationalisation, as the switch in code would be provided by the retailer who would be aware of the local restrictions, with the age checking provided by the bank. Banks would not need to release the card holder's age, assuring privacy when a transaction is approved or declined.

Summary

No single approach to age-verification can guarantee that under 18s can never access alcohol online. Combining methods of authentication can serve to improve success rates but can be cumbersome and off-putting (which is something sellers will naturally wish to avoid). However, offering a selection of verification methods

encourages under 18s to target the weakest (with such information regarding how to do it circulating rapidly through social channels).

Any extension to existing payment mechanisms will require national co-operation from banks to ensure the solutions are universally available and compatible. Although this will present technical challenges in its implementation, a widespread rollout of additional authorisation checks and/or multiple MCC codes would provide a reliable method for verifying that the card holder is over 18 where required, and will be available as a useful protection for both online and offline sales. Extending the measures to debit cards would also provide a future-proof solution as the number of debit card transactions in the UK are increasing year-on-year.

Using a single mechanism for age verification would also allow for easy identification by consumers and consistent adoption by suppliers. The Challenge-25 scheme provides clarity for purchasers and additional support for retailers with implementing the scheme and complying with the relevant legislation [25]. A similar branding for online age verification could provide similar benefits, increasing consumer trust and enabling acceptance of the additional checks.

Emerging and future technologies

There are a small number of start-up companies suggesting the use of innovative new technologies that could help with problems such as age verification without requiring physical checking of an individual's identification. These are discussed briefly here.

Federated authentication

Many online systems are switching to *federated authentication* systems, where a user can sign-in to a website using their login credentials for a different system. These are convenient for the user who will only need to create an account once and can then use the same login details in multiple places. However, the authentication process relies considerably on the integrity of the first system where the user has registered. Without rigorous checks across the entire network, it would be challenging to use this system for age verification and demonstrate the reliability of the data.

Facial recognition

As an extension to the use of physical ID, facial recognition could be used to remove the human element of checking that the right person is using photo identification. This could be useful for checking purchasers if, for example, federated access was available to government issued ID. Although the technology is maturing and has been deployed in widespread use in venues such as airport passport control, its use online depends on the (sophistication of the) users' devices and existence of the ID, neither of which can be controlled within the online environment. This would leave such a system open to both fraudulent use and data protection issues.

Artificial intelligence

The main solution used within the gambling industry is an artificial intelligence service provided by Yoti which is trained to identify a user's age from photographs taken using an app on their mobile phone. These are then compared using a neural network and a set of photographs where the subjects' ages are known, to make a best estimate for the age of the user. The providers claim that the average error rate is at its lowest at 17 years of age, making this technology particularly suitable in industries with an under 18s policy [26]. Even with a low error rate (such as is claimed, though not by independent research), the providers suggest that the technology should be used with a 'buffer zone' typically matching the Challenge-21 or Challenge-25 policies. If purchasers failed the checks, they would be required to verify their age using another method.

Blockchain

Blockchain is a generic term for the use of peer-to-peer cryptographic networks where proof of integrity is shared across many machines in a network. Some identity service providers already use blockchain technologies as a mechanism for their users to authenticate with services, and this can be extended to allow access to online content requiring age verification [27]. Using such technology requires trust throughout the chain between the user and the identity provider. Whilst this is an emerging technology, its widespread use throughout society could be far into the future, when we have devices that will contain the relevant technologies and cryptography to support the necessary assurances. Particularly among emergent technologies, the overall energy requirements (power grid) of Blockchain cannot be ignored.

Summary

There are many emerging technologies that could be developed to provide age verification services, some more immediately and readily than others. However, probably without exception, these are still only able to provide a best effort approach. This may be appropriate for the purposes of content blocking (where only reasonable steps to protect minors are required). However, it would be more challenging to implement these in environments such as alcohol sales where the law explicitly prohibits purchases by under 18s.

Conclusions

The use of appropriate age verification within online alcohol sales largely depends on the retailer: some retailers, including large supermarkets, place considerable emphasis on the verification of the receiver of the goods as a proxy for the purchaser, a situation that is not necessarily accounted for in the relevant laws – although it appears to have become an almost de-facto standard. Other retailers use cursory measures that would be easy for minors to bypass, for example asking for confirmation statements, dates of birth or the availability of a credit card.

There are many newer measures implemented by the age verification service providers within other domains, mainly (and *notably*) governed by the tighter application of laws within these areas. For instance, the much-anticipated (but abandoned) 2019 regulations under the Digital Economy Act 2017 placed a large emphasis on the protection of minors from inappropriate online content, leading to content providers developing or buying in age verification services. These use a variety of measures to provide 'best effort' protection of under 18s. It would appear that such methods were fairly advanced and that the decision not to proceed with their initial use was as much a political one as a technological.

The measures implemented by the alcohol retail industry generally lack integrity: proposed checks often rely on human intervention or use of possessed artefacts that could be traded easily, such as mobile phones or tokens. To ensure age verification checks are conducted appropriately, there needs to be a step change in the methods used by retailers to demonstrate sufficient proof that the purchaser is over the age of 18.

When implementing new technologies, it is important to consider the user journey and path of least resistance. In this case, modifying existing systems to automatically check that banks have verified the card holder to be over the age of 18 could be implemented using the existing MCC codes, ensuring that merchants correctly identify alcohol-containing purchases. This would not need individuals to verify their identity through any other means, reducing the frustration of online sales through the use of existing, or emerging, age verification.

Introducing the use of MCC codes to identify and decline alcohol transactions made by under 18s would be a simple and effective measure to reduce the number of minors who could make such purchases. This would need to be introduced by new regulatory practice to ensure the technologies are implemented in a timely and appropriate manner.

Recommendations

We make the following specific recommendations.

Recommendation 1: The law must be clarified

Despite its best intentions, the current law is ambiguous in relation to how and where safeguards are to be applied to prevent under 18s obtaining alcohol online. If the intention really is to allow age-checking on delivery as a substitute for online verification, then that should be published as official guidance by the relevant authorities. However, knowing such measures to be as ineffective as they are, it is to be hoped that the necessary clarification would move the law in the other direction: that robust online age verification – at the transaction stage – becomes a clear legal requirement.

Recommendation 2: No confidence should be placed on existing safeguards

There are no effective commonly applied methods of online age verification in widespread use, even if more than one approach is combined. Any legal obligation or assumption based on existing measures is unfulfilled and/or flawed and must be unequivocally recognised as such. (Although there are some sophisticated solutions emerging, and arguably ready, there are also some simpler, and more immediate, measures that can be taken as set out in Recommendations 3 and 4 below.

Recommendation 3: Items within online 'shopping baskets' should be considered individually

There is a particular problem when alcohol is a part of a larger (e.g. 'grocery') order. However, the extension of existing systems to 'flag' items subject to age restriction online (in a similar manner to those already used offline) are simple and would lead to more effective application of age verification at the point of transaction. This has the advantage of being a 'software only solution'.

Recommendation 4: The use of MCC codes and bank authorisation processes should be extended

Existing MCC codes, and their use in authenticating a financial transaction back to a bank, can be extended beyond their existing ranges. At present, whilst a transaction at a pub, bar or similar venue can be identified, the purchase of alcohol within a larger food, gift or groceries transaction cannot. This is also easily rectified in software and would allow the bank authentication to deal with age-restricted goods if necessary. (Alternatively, the current Level 3 Line Data system could conceivably be rolled out as an extended open protocol if existing commercial constraints were relaxed.)

Recommendation 5: Relevant emerging technology should be continuously monitored

Aside from those already discussed in relation to age-checking services under development or already available, there appear to be few disruptive technologies on the horizon that will add to existing approaches over the next few years. (Many, in fact, work both for and against effective online age-verification; artificial intelligence systems used visually to judge age, for example, can be fooled by other software that artificially 'ages' the image being processed.) However, these are rapidly moving fields and must be monitored continuously.

Recommendations 3 and 4 will be most effective when applied together.

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Appendix: Documentation

Three pieces of supporting documentation relate to the project:

1. General topics/specific questions (interviews and discussions)
2. Structure of two-way student sessions (pilot study)
3. Questionnaire completed by students (pilot study)

Effective Age-Gating for Online Alcohol Sales

General Topics/Specific Questions for Interviews

We've been commissioned by **Alcohol Change UK** to undertake research into the effectiveness (or otherwise) of online **'age-gating'** processes aimed at **preventing under 18s from buying alcohol via the Internet**. Your expert views will be extremely valuable to us and, unless you specifically suggest otherwise, will not be identified or referenced specifically in our final report.[4]

Generic Background
Interest in/connection with online AG/AV?
Topics/Questions
- What's your role and/or responsibility in respect of online AG/AV?

Legal Issues
Compliance with online AG/AV?
Topics/Questions
- How do you interpret UK legislation in respect to online AG/AV?
- How does this impact on you/your product/service?

Current Approaches (actual)
What do existing solutions do?
Topics/Questions
- What online AG/AV mechanisms are you aware of? (Not necessarily alcohol)
- What experience (first- or second-hand) do you have with these mechanisms?
- What are their strengths and weaknesses?

Available Approaches (in principle)
Are you aware of existing alternatives for online AG/AV?
Topics/Questions
- Are other mechanisms used in other domains? (Gambling, pornography, weaponry, etc.)
- Are other mechanisms used outside of the UK?
- What are their strengths and weaknesses?
- Could these be applied to online alcohol purchases?

Emergent Technologies
Are you aware of available, but currently unused technologies for online AG/AV?
Topics/Questions
- Are there new/emergent technologies that could be used?
- Do you have experience of these? (As a researcher, developer; applied elsewhere?)

Future Technologies
Are you aware of technologies for online AG/AV that may become available in the future?
Topics/Questions
- Are there future technologies that could be used?
- Do you have experience of these? (As a researcher, developer; applied elsewhere?)

If you'd like to know more about this project, or if you'd like to be involved, or if you've more information that you think might be useful to us, do please get in contact with us: Jessica.Muirhead@glyndwr.ac.uk or Vic.Grout@glyndwr.ac.uk.

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[4] Not all topics/questions will be relevant/appropriate for all interviews/discussions: use/ignore as appropriate

Effective Age-Gating for Online Alcohol Sales

In this (hopefully) informative and useful interactive session, any information you can give us will be valuable to our research and will be **strictly anonymous**

Student Session

We've been commissioned by **Alcohol Change UK** to undertake research into the effectiveness (or otherwise) of online **'age-gating'** processes aimed at **preventing under 18s from buying alcohol via the Internet**. Aside from a good discussion of relevant technologies, your thoughts and experience, first-hand or otherwise, will tell us a lot about how this works in reality.

Session Outline

Background: The 'Problem'
Overview of the Glyndŵr EAGOLAS Project
- Aims/Objectives
- Methodology
- Data/Results
- The Report

Part One: Current Approaches

- The Law
- Existing Technologies
- Effectiveness
  - Student experience
    - Group sessions
    - Feedback

Part Two: New Approaches?

- Changing Laws?
- Emerging/Future Technologies
  - Student suggestions
    - Group sessions
    - Feedback

Part Three: What next?

If you'd like to know more about this project, or if you'd like to be involved, or if you've more information that you think might be useful to us (but didn't feel comfortable talking about in class), do please get in contact with us: Jessica.Muirhead@glyndwr.ac.uk or Vic.Grout@glyndwr.ac.uk.

Questionnaire Completed by Students

Confidential Survey on Under 18-year-olds buying alcohol online

Any information you can give us will be valuable to our research and will be **strictly anonymous**

(You'll notice this form contains no means of identifying you in any way)

We've been commissioned by **Alcohol Change UK** to undertake research into the effectiveness (or otherwise) of online **'age-gating'** processes aimed at **preventing under 18s from buying alcohol via the Internet**. Your experience, first-hand or otherwise, will tell us a lot about how this works in reality.

So please help us by answering these simple questions then returning the form. If this is accompanied by a class (or similar) discussion, you'll note that none of it's being recorded and no notes are being taken.

When we talk about 'buying alcohol online', we mean *by any means at all involving the Internet*: Amazon, supermarkets, specialist suppliers, takeaways, delivery services, etc. *Anything!*

QUESTION ONE: Before you were 18, did <u>you</u> ever attempt to buy alcohol online?   YES/NO
    If you did, what year(s)? _____ and were you successful?   YES/NO
    If you succeeded, please give us an outline of how it worked. (Nothing complicated: *'just lied about age', 'fake ID on the Sainsco website', 'pre-paid credit card on Evenbins'*, etc. Keep it simple.)

QUESTION TWO: Do you know of <u>anyone else</u> under 18 who has attempted to buy alcohol online? YES/NO
    If you do, what year(s)? _____ and were they successful?   YES/NO
    If they succeeded, please give us an outline of how it worked. (As before, including: *'don't know'*.)

QUESTION THREE: Is there anything else you'd like to tell us that might help us focus our research?

If you'd like to help with any other aspect of this research, or if there's not enough room on this form to answer properly, etc., then do please contact us directly at Jessica.Muirhead@glyndwr.ac.uk or Vic.Grout@glyndwr.ac.uk

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