

Background to Cornucopia

Cornucopia is used to mean "an abundance". In 2012 Colin Watson created the OWASP Cornucopia deck (set of cards) to help software teams undertake web application security threat modelling reviews, with a similar deck created recently by others to review mobile apps. The OWASP decks consider people and systems attacking applications. In contrast, *DBD Cornucopia* helps e-government service implementation teams model threats to citizen users (welfare benefit claimants). The "attackers" are those who implement the service themselves. Multitudinous harms can arise from choices made, inadvertently or otherwise. The focus of *DBD Cornucopia* is on these decisions, and their effects, but it could explore whether an implementation meets the policy intent, its legislation and its regulations.

The Suits in the DBD Cornucopia Deck

The deck comprises six suits of 13 cards each (Ace, 2-10, Jack, Queen, and King):

- Scope (SC)
- Trust (TR)
- Architecture (AR)
- Porosity (PO)
- Agency (AG)
- Cornucopia (CO)

The suits are broad groupings which, while useful for game play, should not be allowed to restrict the types of harm identified. For example, choices made about the structure of an e-government service are likely to be very relevant in AR, but other architecture-related matters which affect harms to claimants can also arise in the threats described on cards in other suits.

Threats Detailed on the Cards

Each card describes something which can add or increase harms to claimants. The descriptions are technology-agnostic and purposely unspecific; it is up to players to interpret how each might arise in the scope of the review. The card value (e.g. 3, 8, King) is not correlated with the severity of harm, since threats can affect individuals in different ways due to their situations and circumstances, or affect fewer or more claimants, or the harmful effects can arise in claimants' support networks and wider society. Each card is cross-referenced with relevant design recommendations and implications resulting from the research project. The card's focus is identified along with example harms on the website www.digitalbenefits.uk/cornucopia, accessed directly by using the QR code or URL on each card.

Name Associated with each Threat

Each threat to claimants uses a person's name as the "attacker", which can be thought of someone involved with implementation (e.g. "Noah implements features..."). Here "Noah" could have any of the roles listed on the back of the deck case which influence digitisation. So they could be a database administrator, or a copy writer, or a quality assurance specialist, or all of these. Everyone could have some influence on the claimant threat described. The names were randomly selected from those currently most popular as given names for boys and girls (UK Office for National Statistics).

How to Play and Review Harms

Practice on an imaginary or future planned service, rather than trying to find problems with existing digitised systems, until participants are happy with Cornucopia's usefulness. It is possible to play *DBD Cornucopia* in many different ways. Described below is the review process using a trump trick-taking card game.

A. Preparations

- A1. Identify the scope to review; this might be a concept, design or an actual implementation
- A2. Create a data flow diagram, scenarios, user stories, or other artefacts to help the review
- A3. Identify and invite a group of 4-8 people to meet together
- A4. Have some prizes to hand (gold stars, chocolate, pastries, pizza, beer or flowers depending upon your organisation's culture)

B. Play

One suit (CO) acts as trumps. Aces are high (i.e. they beat Kings). It helps if there is a non-player to document the issues and scores.

- B1. If necessary, remove the Jokers and a few low-score cards from the CO suit to ensure each player will have the same number of cards
- B2. Shuffle the deck and deal the cards
- B3. To begin, choose a player randomly who will play the first card - they can play any card from their hand except from the trump suit CO
- B4. To play a card, the player must read it out aloud, consider if the threat exists in any part of the service being reviewed, and if that threat

could affect claimants (see the online reference for tips); the player gets a point for identifying a valid threat which harms claimants in some way; do not try to think how to address the harms yet, and do not exclude a threat just because of a belief that it is already treated; someone note the card and record the issues raised

- B5. Play clockwise, each person must play a card in the same way; if they have any card matching the lead suit, one must be played otherwise they can play a card from any other suit; only a higher card of the same suit, or the highest card in the trump suit CO, wins the hand
- B6. The person who wins the round, leads the next round (i.e. they play first), and thus defines the next lead suit
- B7. Repeat until all the cards are played

C. Scoring

The objective is to identify applicable threats and resulting harms, and also win hands (rounds):

- C1. Score +1 for each card you can identify as a valid threat in the scope under consideration
- C2. Score +1 if you win a round
- C3. Once all cards have been played, whoever has the most points wins

D. Closure (post game)

- D1. Inspect all the threats and harms identified
- D2. Determine how each will be treated (avoid, mitigate, transfer, contingency, monitor, tolerate)
- D3. Create requirements, user stories, specifications and test cases as required for your development methodology.

Alternative Game Rules

If you are new to the game, remove the Aces and two Joker cards to begin with, and add them back in once people become more familiar with the process. Apart from the “trumps card game” rules described above, the deck can also be played as the “twenty-one card game” (also known as “pontoon” or “blackjack”). Consider just playing with one suit at a time to make shorter sessions. It is also possible to play a full hand of cards, and then discuss what is on the cards after each round (instead of after each person plays a card). Another option is that if a player fails to identify the card is relevant, allow other players to suggest ideas, and potentially let them gain the point for the card. Consider allowing extra points for especially good contributions. You can even play alone by using the cards as prompts; involving more people will usually be beneficial though.

Review of Other E-Government Services

You could adapt *DBD Cornucopia* for other services; many of the threats will still be relevant, but may require rewording. Wording changes will also be necessary for different jurisdictions.

Digital Benefits and Disbenefits Project

DBD Cornucopia was created using findings from Colin Watson’s own doctoral qualitative human-computer interaction (HCI) research project undertaken 2019–2023 at Open Lab, Newcastle University, UK. The Digital Benefits and Disbenefits project explored e-government

technology-generated remote self-service encounters in welfare benefit public services, from the point of view of claimants. The aim was to identify and mitigate the harms (negative effects on claimants) arising from digitisation design itself, separate to policy choices (e.g. legislation, regulations) or the inherent nature of digital channels (e.g. availability of devices, internet access, ability to use devices and software). Public information appertaining to the research project such as briefing documents, academic papers, informational posters and files/reference materials for *DBD Cornucopia* are available at www.digitalbenefits.uk

Research Acknowledgements

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Cornucopia Acknowledgements

The Elevation of Privilege (EoP) Threat Modelling Game developed by Adam Shostack and the Microsoft SDL Team was the inspiration to Colin Watson for the original OWASP Cornucopia. OWASP’s card decks and information are open source and available at cornucopia.owasp.org; its past and present leaders and numerous other volunteers have continued to support and develop the game. *DBD Cornucopia* incorporates content and knowledge from the OWASP project, using the same game play, but different suits, threats, harms and reference materials.

Deck Packaging

The first professionally printed OWASP deck was distributed in a box which resembled a pack of cigarettes labelled with health warnings. Acknowledging that idea and the domestic nature of the harms, the *DBD Cornucopia* box is presented in the style of a powdered laundry detergent package, based on the notion that reducing harms is, in some way, cleaning up the e-government service. Sometimes humour is also necessary to counteract harms, and fun can help awareness and encourage use.

Licence

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Made in Byker, Newcastle upon Tyne, UK by Colin Watson in summer 2024.

DR WATSON’S

DIGITAL BENEFITS AND DISBENEFITS

CORNUCOPIA

E-GOVERNMENT SERVICE WASH UP

Digital Benefits and Disbenefits Cornucopia (*DBD Cornucopia*) helps identify how digitisation choices can harm welfare benefit claimants using gamification. The mechanism is in the form of a card game to assist teams, that are implementing welfare benefit e-government services, to identify requirements in agile, conventional and formal development processes. All views and perspectives matter and thus everyone can, and should, contribute to identifying problems, which can then be analysed, assessed and acted upon.

The intention is to improve policy delivery and increase service uptake. “Welfare benefits” are a type of social protection payment in the UK. The deck uses “claimant” to mean all citizens who might need to or intend to apply for support, those who actually apply (making a claim), and those receiving a payment award (maintaining a claim). Reviews consider all claimant activities before, during and after online service access.

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