Blocked + Loaded: Digitizing Smart Guns with Blockchain Technology

Abstract Concept of Tokenizing Smart Guns

Despite the growing popularity and potential to disrupt a number of industries, blockchain technology still remains a mystery to the average consumer. Given the steep learning curve for understanding blockchain technology, its use cases and long-term potential remain obscure and irrelevant to the general public.

With blocked + loaded, smart gun owners have the opportunity to create, own, and validate their smart guns on the blockchain by digitizing these assets into non-fungible ERC-721 tokens. The digitization of physical smart guns to ERC-721 tokens creates the opportunity for a proof of purchase of each individual gun as well as an official log of each transaction preceding the current owner's purchase.

blocked + loaded seeks to make blockchain technology more accessible to the average consumer by creating an approachable, easy-to-follow brand that abstracts away the details of smart contract and cryptocurrency transactions. By doing so, users of all levels of technical knowledge will feel empowered to use technical solution to solve a very pressing problem that our society faces.

Therefore, our users don't have to understand the complexity and technicalities of our blockchain solution because it is simply a means to and end, not the value proposition itself. We want this product to be accessible to any and all gun owners who are looking for a way to prove ownership of their firearm and use a robust contract to represent their physical transaction.

1. Motivation for Creating Blocked + Loaded

The idea for blocked + loaded came about from a common desire among our team to use blockchain technology for positive social impact. The public's understanding of blockchain technology is almost entirely limited to cryptocurrency and the Bitcoin miracle for turning $10 to $10,000 overnight. We want to show the average consumer that the cryptocurrency stories making headlines are not the end of blockchain technology.

1.1 Utilizing the Distributed Ledger as the Ultimate Bookkeeper

In general, gun ownership today is missing a key feature: proof of ownership. As of currently, there is no normalized or mandated system for recording ownership of one's firearms and thus there is no system or standard of truth for how a firearm reached one's hands. Smart gun manufacturers have taken the approach of creating a technology that prevents guns from falling in the wrong hands because the gun will only fire if triggered by the "right" hands, but what about knowing whose hands it came from in the first place?

Recording proof of ownership on the Ethereum blockchain is a practical application of blockchain technology where ownership at any point in time throughout the changing of hands in a gun's lifetime is immutable. This is an extremely important feature that smart gun technology, and guns in general, cannot support currently.

1.2 Introducing ERC-721 Tokens in an Approachable Way

In addition to using our technology as a means to record the lifecycle of ownership with regards to each individual smart guns, digitizing the guns into non-fungible ERC-721 tokens is simple and incredibly approachable to consumers. Each unique physical gun is represented digitally by a unique and non-fungible token, so that when the physical exchange takes place, the token is also exchanged from one wallet to the next.

Most tokens on the blockchain are fungible, meaning that the value of every token is the same and it doesn't matter which token you receive because they were all created equally. Due to this nature of mutual interchangeability, blockchain technology tends to track the counts of these tokens instead of the actual tokens themselves. While this may work for currencies that represent monetary values, a non-fungible token would not work to represent physical guns when no two smart guns or smart gun *lifecycles* are exactly the same.

For this reason we chose to represent the physical guns with non-fungible tokens called PISTLs so that no PISTL could be destroyed, replicated, or taken away. Under this protocol, blocked + loaded is simply a digital interface to represent the exchange of physical assets in a way that consumers can trust.

1.3 Exchanging Hands Using Smart Contracts

To further develop trust, the final feature of our product consists of using robust smart contracts to conduct the digital (and thus also the physical) transactions that both parties agree on. To do this, we implemented smart contracts with logic so that the digital transaction will occur only if the following physical requirements are met:

- Purchaser/seller is a valid gun owner or has ownership approval
- Physical gun is registered and tied to a nonfungible token prior to the transaction
- In the case of auctioning, purchaser has enough ether to purchase gun

1.4 The Future of Smart Guns

We believe that both smart gun advocates and opponents will express positive reception to our product because it is a point of compromise between the two sides. If it gains momentum and becomes more widely used, blocked + loaded has the potential to make a pivotal impact on the smart gun market.

- The smart gun market has faced significant opposition since beta versions of these guns came out because the market would be institutionally centralized. After reaching the market, mandating smart guns would require the help of a central entity such as the government, which is exactly what opposers such as the NRA want to avoid.

- We believe that blocked + loaded is the **piece** that smart gun manufacturers are **missing**, which is why we have chosen to disrupt the smart gun market.

- By partnering up with smart gun manufacturers, our technology would pose a decentralized platform on which the smart gun market could thrive.

By normalizing the practical application of smart contracts and abstracting away the technical details, we hope that everyday gun owners will understand the practicality of blockchain technology and appreciate the digitization and documentation of their assets on a distributed ledger.

2. The Product

blocked + loaded revamps the peer-to-peer smart gun market by using the Ethereum blockchain to **validate sellers and purchasers** of smart guns, to **allow the transfer of gun ownership** between users, and to provide users **the opportunity to auction** their guns to other users.

2.1 Gamification of the Ethereum Blockchain

At launch, users will be able to register their smart gun onto our platform then put their gun up for auction or transfer ownership to another user. Because blockchain is still an emerging technology, we set up a straightforward user registration by simply requiring a user to input their Metamask wallet to use this platform. This abstracts the backend blockchain architecture to our targeted users who may only have basic fluency in technology. With that said, we do plan to explore other alternatives to Metamask for simplest user accessibility.

2.2 Proven Mechanics and User Appeal

A major characteristic of blockchain technology is the fact that smart contracts are immutable. Although this allows us to build a product that decentralizes the smart gun peer-to-peer market, it also means that we are not able to edit transactions as soon as they are submitted. Therefore, extensive testing and user feedback is essential to ensure that we thoroughly explore the product's mechanics and provide security of users' personal information. That being said, proof of concept is necessary to ensure trust in both the project and the Ethereum blockchain technology architecture.

We tested our product by conducting interviews at the **Daly City Gun Show** on November 10 to pinpoint the desires of our user persona. With the feedback we received through our submissions, we fixed our flaws in the contract to adhere to what we believed was the most important for our minimum viable product. Our current version of the smart contract utilizes the fact that every gun registered into blocked + loaded is unique and introduced the usage of a non-fungible ERC-721 token to represent each gun. The ERC-721 protocol for non-fungible tokens provided us a standard to condone transactions and transfer of ownership on the blockchain with greatest ease.

Furthermore, rather than requiring the input of personal information of users - which was a major concern shown in our feedback - we base user registration off the security and accessibility of Metamask. These two major implementations to our smart contract proved to be successful when we deployed this application however, minor tweaks will be made to ensure a stable final product.

2.3 A Sustainable Revenue Model

Surveys indicate **5% market penetration** of this market of gun owners, who will be willing to buy their guns from a smart gun manufacturer on the blockchain in the first 5 years. smart gun manufacturers will initially register each smart gun to an ERC-721 token on our platform and after a gen0 sale give us 5% of the profit.

0.05 * $1400 * 9.74M = $679M or $135.8M/year

Once the gun has been tied to a non-fungible token on our platform, we will take a 3.75% fee for each successful transaction.

0.0375 * $135.8M/year = $5.1M/year

We believe that by posing a solution to the problems that smart gun manufacturers are currently facing that it is incentive for them to give us a cut of their profit. By partnering up with these manufacturers we will essentially be creating a product that could make a significant impact on the flow of guns as a whole, solving today's problems with a solution that doesn't already exist!