



Stigmergy at the edge: Adversarial stigmergy in the war on drugs

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Abstract

As a consequence of the stigmergic coordination that occurs among criminal and government agents, resilience has been built into the system that supplies illegal drugs to American consumers. Criminal agents create technology responses that are simple and cost-effective, and consistently defeat the actions of government agents. Those responses to stigmergic stimulus improve iteratively the resilience and sophistication of the clandestine supply chains. In what the author calls a “homeland security Chaos Monkey model” a constant but predictable governmental escalation in the war on drugs plays the role of a failure signal to build resilience in the narcotics system: Any success by governmental agents sends stigmergic signals to criminal agents. These signals communicate a failure in the supply chain that requires an adversarial innovation to defeat the updated shape of the interdiction. The result is a more resilient system. This cycle of adversarial stigmergy has encouraged the emergence of a well-coordinated system of clandestine innovation in the territory of the US–Mexico borderlands that takes advantage of the border switch to solve in an iterative form one particular problem: to identify and exploit the vulnerabilities of a complicated enforcement architecture to build resilient narcotics systems. For homeland security policies to be more effective, interdiction policies and technologies should be built with a better understanding of the stigmergic forces that shape adaptation in the war on drugs system.

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1. Introduction

Pierre-Paul Grasse identified for the first time the importance of indirect (environmental) stimulus–response patterns while studying how termites were capable of creating complex habitats through coordination without central command. The most singular characteristic of this stigmergy, as Grasse called the phenomenon, is that the stimuli that guide social insects does not originate from other agents, but from the environment that regulates their actions in an iterative process. Therefore, there is no need for agents to be rationally aware of the actions of each other or even of their existence (Grasse, 1961).

The bounded rationality of human beings (Holbrook, 2002), as well as the limited information they gather from the environment are the two main reasons why, even if we admit that the average human is probably more intelligent than a “genius” termite, human–human stigmergy is a powerful kind of coordination of the same kind as those behaviors Grasse identified for social insects. It is “a way for members of a large distributed population, whatever their individual cognitive capabilities, to coordinate themselves with bounded computational resources” (Weyns, Parunak, & Michel, 2006).

Systemic dependencies affect us all despite our intelligence, free will, self-consciousness and rationality because our actions are still the product of limited information about the environment in which we operate. As in the case of termites, stigmergic patterns influence human behavior all the time.

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This paper will explain how resilience has been built into the system that supplies illegal drugs to American consumers as a consequence of 30 years of adversarial stigmery between two kinds of interdependent agents:

- (1) Governmental agents.
- (2) Criminal agents.

Zolli defines resilience as “the capacity of a system, enterprise or a person to maintain its core purpose and integrity in the face of dramatically changed circumstances” (Zolli & Healy, 2012). In the case of the illegal narcotics system, its core purpose is to provide illegal products (mostly pharmacological) that are desired by consumers and for which a black market exists or can be created. They perform an arbitrage activity between human desire and legal availability that rewards them with a risk-premium. This system has persisted despite dramatic changes in circumstances (e.g. the capture of a drug kingpin, cartel wars or the construction of expensive border walls).

Criminal agents confront government agents in an interdependent, adversarial relation that constantly “shocks” the system. Nevertheless, the core purpose of the system is maintained through innovation: Drugs do not stop flowing from the territories of production to the territories of consumption despite constant shocks, but they flow through dramatically different paths.

Stigmery coordination induces supply chain resilience as criminal agents learn from government actors how to improve their organizations and technologies. Criminal agents coordinate stigmery with governmental agents (mostly involuntarily) to generate resilient drug supply mechanisms.

A well documented practical implementation of how this mechanism works comes from a different industry: Netflix created a system they call “Chaos Monkey” to make their systems more resilient. When activated, this nasty cyber-simian breaks parts of the Netflix network on purpose. Its designers explain the value of the Chaos Monkey in the following way: “we have found that the best defense against major unexpected failures is to fail often. By frequently causing failures, we force our services to be built in a way that is more resilient” (Techblog.netflix.com, 2012). As any movie fan knows, Netflix manages one of the most persistent Internet services available. They engineered reliability by introducing constant failure.

Measures introduced by governmental agents to enforce counternarcotics interdictions (e.g. a new section of the border wall or a new anti money-laundry law) work as a kind of Chaos Monkey for the narcotics system. Every change introduced by this homeland security Chaos Monkey sends stigmery stimuli to the criminal agents who have to respond through trial and error to test alternative solutions to the new shape of the problem. The best solutions are repeated and improved while the bad solutions get the innovators in prison or killed. The narcotics system,

like Netflix, prevents catastrophic failure by failing often... and agents learn from those failures.

The escalation dynamics in the war on drugs play the role of a Chaos Monkey in the stabilization of the narcotics system: Any success by governmental agents sends stigmery signals to criminal agents. These signals communicate a failure in the supply chain (i.e. The homeland security chaos monkey has wreaked some havoc) that requires an adversarial innovation to defeat the updated shape of the interdiction.

The homeland security Chaos Monkey, a constant but predictable governmental escalation that shuts down parts of the network, sends variable stigmery threat signals to criminal agents that trigger adversarial innovation responses (i.e. cartels do not rest on their laurels). After some failures, criminal entrepreneurs will find out novel mechanisms to improve their distribution channels.

As a consequence, adversarial stigmery among government and criminal agents trims iteratively the clandestine supply chains of its most inefficient parts, without ever compromising its critical integrity, making them very resilient. Legitimate networks are normally not this effective at finding their weak links (Netflix being an exception)!

The Chaos Monkey model in the narcotics system originates a pervasive kind of coordination that makes criminal behaviors resilient. Adversarial stigmery, the heart of the Chaos Monkey “model” explains many of the policy failures of the so-called war on drugs.

2. Stigmery and the “Chaos Monkey”

Innovation drives the adversarial stigmery that links government and criminal agents in this homeland security Chaos Monkey model in the following way:

Step 1. Government actors release an instance of the homeland security Chaos Monkey by deploying resources and agents in key territories (e.g. border walls) and by using their regulatory powers to modify environments to enforce the interdiction (e.g. changes in financial laws to fight against money laundering), shocking the narcotics system.

Step 2. This Chaos Monkey wreaks havoc to some sections of the supply chain and the criminal agents perceive the stigmery signals left by the Chaos Monkey (e.g. drug seizures, criminals killed, etc.). Those environmental and territorial changes create conditions for adversarial stigmery to emerge.

Step 3. As the homeland security Chaos Monkey does its job, some parts of the supply chain may be permanently destroyed and some criminal agents may be captured or killed. This destruction leaves stigmery traces in environments and territories. The surviving criminal agents learn indirectly about these changes from those traces in territories (e.g. a new wall section) and in the environment (e.g. the news reports in the media).

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