Where's the %*!@**^# Esc Key?

Charles M. Kahn*

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Abstract

Fintech and crypto payments systems lack the bureaucracy that established financial services and payments arrangements include. This is in fact a *disadvantage* if the goal is to become mainstream providers, because bureaucratization provides standardized, if sometimes inconvenient, ways of dealing with exceptions. Successful technological innovations in finance tend to be co-opted by existing providers. Despite the rhetoric for the latest systems as being new independent uncorrupted and unencumbered ways of doing business, the developments point to their taking on traditional governance and exception handling techniques. We illustrate these points with recent and not-so-recent examples in payments and settlement systems.

A few weeks ago, I tried updating my registration at the website for a financial firm where I do business. Tried and repeatedly failed. Apparently, the problem was that the site had recorded a couple of different e-mail addresses for me, and they were incompatible with the rest of the information the company had on me—and of course there was no way to adjust the information online without access to the site. Furthermore, with reduction in the availability of human assistance, the site had hidden all phone lines and left only an automated help arrangement whose FAQ's and information set didn't cover the problem.

Automation makes the 95% of interactions between customers and businesses more efficient, but it doesn't handle exceptions very well. Not only are the exception handlers themselves automated, they are also more difficult to navigate. When I get into a telephone tree, where it is not immediately clear which of the alternatives applies to me, my instant instinct is to press nine for assistance. (That is also the immediate instinct of everybody older than generation Z.) Therefore companies, in self-defense, impose a cost on so doing, in the form of a wait for the next available operator. Were it painless

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*Department of Finance, Gies College of Business, University of Illinois. This paper is adapted from a keynote speech at Economics of Payments XIII, Oesterreichische Nationalbank, Vienna, September 25, 2024

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to get to an operator, no one would use the tree. Moreover, even if it is costly to avoid the tree, there is still a temptation to bypass it—to look for the "Escape Key"—in the hopes of getting more merciful treatment from a human than from the cold logic of a computer. The tree is an acknowledgement that most problems do in fact have standard solutions, and a rational presentation of those standard solutions, whether telephone trees or FAQs, makes things simpler for the company and, arguably, fairer, and certainly more predictable, for the user.

Automation of exception handlers is an example of bureaucratization. As the celebrated sociologist Max Weber observed [Weber, 1958], bureaucracy, whether governmental or business, while rationalizing processes, creates its own set of problems: Centralizing and standardizing eliminates discretion at the lower levels, and concentrates power and discretion—that is, exception handling—further up the hierarchy. The current paper argues that this process is predictive of the future of fintech and payments services in the financial industry.

Right now, the most pressing questions in the economics of payment and fintech are questions of industrial organization: what will be the market structure that arises from all the innovation we are seeing right now? Cheerleaders for the innovations love to predict wholesale revolutions: dinosaur institutions will be replaced by upstarts with new and better ways of doing business. Just as in other branches of technology, the organizations dominating the financial landscape in, say, ten years' time won't have existed fifteen years ago. On the other side are the Luddites—who argue that for all the ballyhoo, the most innovative of the financial technologies are solutions in search of a problem; and that most individuals will never find them more than a curiosity. Like stamp collecting, curling, or Dungeons and Dragons, most of us will be aware of them, but they will end up as a niche presence, of serious interest to a limited set of enthusiasts.

Previous instances of technological adoption by the financial services industry actually have headed in neither of these two directions. Instead, the existing firms have been extraordinarily adept at co-option. Banks have repeatedly survived the predictions of their demise,[1] and credit card also have a track record of surviving technological change. BankAmericard, the predecessor of Visa, started in 1958 as a service of the California-based Bank of America, and the original implementations were strictly

[1] For example, a cover article of Time Magazine predicts the demise of banks in the face of technological developments in payments, asking, "Are banks really necessary?" A really good question—but the article was written in 1998 and banks are still around. [Ramo, 1998].

analog. The original plastic cards were embossed with the cardholder's name and account number slightly raised from the card surface, and the salesperson used a mechanical device not-so-affectionately known as a "knuckle buster" to make an imprint on a piece of paper to record the transaction. Fraud was controlled by the card company printing every few weeks a pamphlet listing counterfeit or stolen card numbers, which clerks would refer to during the transaction in hopes of catching and impounding an invalid card in return for a reward from the company. The technology has come a long way since then.

Of course, sometimes the hype exceeds the substance of the innovations. For example, a 1997 industry report by the consultants Booz and company [Howe and Ranasinghe, 1997], proclaims that "nearly all credit card issuers (98 percent) have a presence on the Internet or are working toward establishing some type of presence." Further on in the report, however, it becomes apparent that "internet presence" for more than half of them simply means having a website with information such as the firm's telephone number for applying for an account. Currently there are any number of technology companies eager to help financial institutions adopt new payments technologies, intended to enable credit cards to meet the challenges from alternatives such digital wallets or WeChat and Alipay. Again the offerings are often less revolutionary than they might seem—sometimes, simply reworkings of the existing ledger systems to make them more quickly able to incorporate new functionalities as they arise.

But even for more radical changes observable in the current flurry of innovation, the process is likely to end up being much the same—the technologies are adopted by existing financial giants, incorporated into their existing structures, and the institutions proceed with a new set of tools but not much fundamental change to their operations. Because, despite the heady valuations of cryptocurrencies, despite all the investment into independent startups, these institutions are still largely outside the mainstream of financial interactions. If you're not a crypto enthusiast, or a money launderer, or (to be fair) an inhabitant of a country where money and payment are dysfunctional, there is little interest. The technology may be revolutionary, but as far as the financial industry's impact on the public is concerned the revolution still hasn't arrived.

There's nothing wrong with providing the back-office technology to banks. If you look on the website of my local bank, you'll find that the e-banking services, like those of many community banks in the US, are in fact provided by "Profit Stars," a subsidiary of the Jack Henry company—a major payments service provider and, a large and very profitable business. Nonetheless, becoming a back-office service of existing institutions is probably not what the biggest visionaries had in mind.

The prediction that co-option will continue comes back to the advantages and disadvantages of bureaucracy. For a revolutionary system to become mainstream, it must meet a couple of major challenges. The easier one is to make the system more user friendly. In their development from early models, automobiles became less needful of mechanically sophisticated intervention by their drivers. The computer industry for its part has lots of experience in expanding the usability of new products to wider and wider audiences by simplifying the interfaces and making widely-used programs and apps more nearly idiot proof. And while these expansions inevitably leave the earlier adopters seething as they hide more arcane but well-loved buttons, they are usually such as to make the product acceptable by the wider public.

However, the harder challenge is to develop seamless interfaces with legacy systems. With electric vehicles, the bottlenecks in adoption are not with the individual cars, but with the difficulties of developing networks of electric chargers. With fintechs and new payments systems the bottlenecks are not internal, but in the on and off ramps. First of all, part of the difficulty is due to the unwillingness of existing financial institutions (incumbents) to play nicely with the newcomers. Financial systems include lots of networks, and network externalities are a big advantage. Why should incumbents be interested in letting upstarts join the networks? Why should a bank be interested in letting a payment service provider have easy access to valuable customer information? If a new technology is cost saving and poses no threat to incumbents' market power, a bank adopts quickly. The adoption of AI techniques makes customer service arrangements even cheaper—and financial institutions have happily jumped in, even when the experience is marginally worse for us customers. On the other hand, when financial institutions announce participation in long run projects piloting revolutionary arrangements, don't expect observable effects any time soon.

Second, even when the innovation provides benefits both to customers and institutions, adoption can be slow because of first-mover disadvantages. In the US the adoption of chip and pin has reduced credit card fraud significantly. But the adoption lagged because of the chicken-and-egg problem: why should banks issue chip and pin cards when merchants lacked the appropriate technology—and why should merchants pay for the technology when customers didn't have the cards? In Brazil, the regulators forced large banks to join the instant payments system Pix [Saiyid, 2023]. Coercion was felt to be necessary to get the system up and running, even though (at least according to its developers) its success has ended up yielding profits to those banks. One role for government is to

break open the incumbent club and coordinate the adoption of technologies; a notable example is the EU's Revised Payment Service Directive, carving out a role for new institutions [ECB, 2018].

Third, there is a misunderstanding by upstart institutions of how and why to play nicely with governments and legal structures. Part of that is of course, ideological—there is a strain of radical libertarianism in the developers of alternative financial arrangements, a desire to maintain independence from the existing "corrupt" regimes. But a large part of it, I think, is a misunderstanding about the needs for and uses of escape keys. Let me explain with an analogy to contracts.

Early in my career, I decided to sit in on a course in contract law. As a theoretical economist working on incentives and information, I figured I knew what a contract was: a mathematical function from the state space into agent actions—that's how mathematical economics modeled them. This supposed insight did not go over well with the law professor. Contract law in fact focuses largely on the edges of what economists think of as contracts—on what happens when states have been omitted from the agreement, when there is disagreement about the interpretation of the function—that is, on the escape keys. Existing financial institutions also put an extraordinary amount of effort into these questions in two ways: by describing in excruciating detail as part of their arrangements the sequence of actions to be taken in exceptional circumstances, *and* by specifying the governance structure to be used when this tree of alternatives runs out and discretion must be employed to fill in the gaps. In other words, they establish a bureaucracy.

An interesting example that illustrates this is the clearing house. A clearing house is an institution that is an essential piece of financial infrastructure in major financial markets. It provides the services that lead up to the settlement of a transaction. Consider, for concreteness, the clearing house of a derivatives market like the Chicago Mercantile Exchange. While the job of establishing the trading floor may have its tricky conceptual problems, in principle the clearing house function is fairly simple: Once trades have occurred, the traders' positions need recalculating, and margin requirements need reassessing and collecting as collateral and position values change. These tasks are highly automated, and ripe for innovations making them ever more precise and rapid—it would seem like dinosaurs with legacy technologies and ways of doing business would be at a distinct disadvantage against upstarts.

But the dinosaur also has some important advantages. The most important is a deep and long-standing rulebook about the exceptions and how they should be handled [CME, nd]. Chapter 8 of the CME rulebook deals with clearing houses—and what should happen when something goes wrong: who

owes what in case of a default, which funds from which sources are applied in which order, what to do when mistakes are found on the records, what counts as proper margin and offsets. Just as important in the longer term is governance which explains what to do when the rulebook runs out, or when unanticipated arrangements arise. Indeed the success or failure of futures exchanges during crises depends greatly on whether these structures were put together sensibly and whether the decisions in the crisis were effective. In crisis judgement calls need to be made: is this the time to suspend the rules and if so how, exactly? Allow for greater time to meet margin? Shut trading temporarily? Reprice the underlying contracts in some way? And who gets to decide?

Failures of central counterparties are extremely rare, but they do occur. France and Kahn [2016] consider examples, notably the Paris sugar market in 1974 and the Hong Kong futures exchange in 1987, and find that they stem from decisions that were viewed as arbitrarily favoring one set of traders over another in an emergency, leading to the disfavored group's unwillingness to continue to participate when the crisis abated. If the rules are good and the governance is good, then the institution is more likely to survive successive crises. To incentivize this, we need governance by entities that have a stake in the success of the institution itself. In the traditional case of futures markets in the US the governance was dependent on owners of "seats" on the exchange. In the corporate world at large that role is taken by shareholders delegating to boards of directors.

Crypto currencies are intended as new environment. Brownworth et al [2023] argue that the two factors making them different are open access—anyone can play any role—and built-in incentives for good behavior. I'd argue that this is not a clear distinction from traditional structures. In fact crypto structures are, if anything, beginning to duplicate traditional structures. In the crypto world, the governance role, in analogy with shareholders, is increasingly commonly taken on by owners of DAO tokens. Ownership of the coins provides voting power on governance issues, and the value of the coins depends on the value placed on the institution. As of late November, 2024, the total market cap of the various DAO coins was over 31 billion dollars.[2]

Now the situation in fintech exchanges is not quite analogous to that of the futures market, in one important respect. The futures markets do not directly deal with the public. CME, like other trading institutions deals directly with its members only—a limited group, who in turn deal with the public. Thus customer service is delegated in a hierarchical fashion. The philosophy of decentralized exchanges is to

[2] https://coinmarketcap.com/view/dao/

eliminate hierarchies—to have the customers deal with one another directly. This philosophy is not strictly adhered to in practice, as middlemen jump in to provide intermediation. Still, as an ideal, it has an effect, forcing a limitation on the complexity of the rule book, relative to established exchanges. After all, the upstarts don't yet have the market power to impose complex rules—customers will walk away.

And in analogy to the examples in the case of traditional derivatives markets, the success of the arrangement depends on a careful balancing between governors and users. What happens when ownership of futures exchange seats is concentrated among a particular class of traders—for example, as in the failures noted, domestic rather than foreign traders? What deters conflicts of interest when a few particular holders of cryptocurrencies obtain 51% of DAO tokens? In emergencies how are changes arranged? [Feichtinger et al, 2024]. For example—the smart contract underlying a coin may convey blacklisting powers locking addresses that contain stolen value. The coin locks in compliance with court orders. Although some libertarian-minded supporters are enraged ("Central government control and censorship is just going to get worse") [Mapperson, 2020], this ability has become increasingly important over time.

While designers of smart contracts envisage arrangements in which *every* alternative is automatically incorporated into the text, the history makes it clear that this goal is a mirage. In November 2017, Tether revealed that $31 million worth of coins had been stolen from its treasury's wallet and announced that it would not redeem these coins, unilaterally overriding its existing software [BBC, 2017, Tether, 2017]. Over time, Tether has regularized the banning of addresses [Waterman, 2023, Tether, 2024].[3] But these modifications in turn lead further into governance questions: who decides the circumstances in which blocking will occur, or when the rules themselves will be overridden or modified, and how quickly can this occur? In any event, pursuing this dream is not the way to widespread usage. Customers will want both simplicity *and* the ability to deal with exceptions, fraud, unexpected events. And while some will not worry on a day-to-day basis about systemic breakdowns, the government regulators certainly will: is the system FDIC insured, like Zelle, where funds never leave the bank? Or are accounts held through a non-banking institution like Venmo? Younger customers may be happy to give up FDIC protection in return for reduced clunkiness, but as the system becomes systemically important, regulators may be unwilling to leave it outside the protective ring.

[3]For figures on number of addresses banned, see https://dune.com/phabc/usdt---banned-addresses

As the systems mature, the ideal of independence from the existing structures becomes ever more remote. In well-functioning legal systems, the most robust set of procedures and precedents are embodied in the established rules and regulations. Instead of reinventing the wheel, the systems eventually plug into these structures as they become more complex. Meanwhile the legal structures themselves adapt and expand their rules to cover the new situations.[4]

In the case of issues of privacy these considerations become particularly complicated [Kahn, 2018]. We're ambivalent about privacy: We're all in favor of other people having privacy, except when they're doing bad things. So I want the government to find out what people are doing in some cases, but how do I limit to those cases I agree with? Personally I would never do bad things. (If I do illegal things, I obviously only do illegal things that really shouldn't have been illegal in the first place.) Thus I'm in favor of complete privacy for myself—I want sites to protect me against people finding out about the payments I made—except, of course, when I don't. As a practical example, I want finality in a payment system: once the transaction is done I want not to have to deal with the counterparty again. I don't want him trying to claim that the payment was inadequate in some way or pestering me for repeat sales or upgrades I'm uninterested in, so I want privacy from him. And I don't want anybody selling my information to questionable third parties. Therefore, I also don't want the payment company to know about who was paid what—except when I make a mistake and want the payment undone. And so the system has to make rules for when the privacy will or will not be breached, and rules for the rules, and as the rules get more complicated, procedures must be put in place to enforce them, and judgement calls as to which rules apply in which situation will ultimately leave the contracts incomplete.

We're back to the need for the legal system to provide escapes and defaults. But since we're also worried about government overreach we need limits on the regulations as well. Ultimately we want a division of responsibilities. We can't put our trust entirely in any single payments infrastructure; we'll probably need some combination of payments providers with different standards of privacy protection and attuned to different privacy concerns. I'm skeptical of the ability of a central bank to provide such privacy protections on its own, but I can see it as the natural watchdog over the privacy standards imposed on private systems. Overall we will then want a legal structure regulating this ecosystem while maintaining some distance from it. This is not going to be an easy balance to achieve, and we'll have to expect to readjust and fine tune it over time.

[4] For example, the UK considers how to apply bankruptcy law to digital assets [UKJT, 2024]

In summary, for the designers of payment systems, the message is pretty clear: if you become widely accepted, you'll need bureaucracy, regulatory compliance, and escape keys. The messages for regulators are more complex: Obviously regulations need to be tailored to the new situations. PSD2 in the EU has recognized the need for adjustment from general bank regulation to regulation for payments service providers. Cryptocurrencies provide a more ambiguous situation. The shallower structures and lack of escape keys stemming from automaticity would imply tighter scrutiny for consumer protection and financial stability. Regulators will want to understand the governance structures and the off switches that can be used in emergencies. However, the ease of moving offshore limits the ability of domestic regulators to impose sanctions. As other observers have noted, it will be important to engage trade associations of these organizations to engage in partial self-regulation. While the jury is still out on the long-run relevance of cryptocurrencies, decentralized exchanges, and the rest of the fintech juggernaut, the technology is still changing rapidly. Central banks will need to put resources into understanding these developments and being ready to respond.

Meanwhile, in case anyone at that financial firm is reading this, you people *still* haven't gotten my account straightened out.

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