



Banking on Granular Information Ownership

A White Paper

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By Steve Holcombe, CEO, Pardalis, Inc.

“The instinct of ownership is fundamental in man’s nature.”

William James, American Philosopher (1842-1910)

About Pardalis, Inc. and the Author

Steven L. Holcombe, President and Chief Executive Officer of Pardalis, Inc., formed the company in 1994 and directed successful efforts to develop, market and support software for the inventorying and management of hazardous chemical information sought by environmental, health and safety managers throughout the United States and Canada. To further improve upon the quality and efficiency of data capture and management, in 2000 Holcombe jointly worked with Dr. Marvin L. Stone to invent the now patented Common Point Authoring System™.

Banking on Granular Information Ownership

Introduction

You have probably never heard of a technology company that claims to be dynamically solving both a technological and a political issue. Information ownership on the Internet is both a technological and a political issue. To alleviate these critical issues, this paper proposes new technological choices for people to privately bank and granularly use their information like they privately bank and granularly use their money.

Information ownership on the Internet is a technological issue because it requires new, sophisticated methods for empowering information producers with control that they themselves recognize as ownership. It is a political issue because, well, on the political scale, ownership rights rank right up there with life and liberty.¹

My company's motto is that 'data ownership matters'. It matters because increased *technological* ownership placed in the hands of information producers, over and above *legislated* notification requirements affording limited privacy protections, holds forth the promise of breaking up current and imminent political controversies centering on information ownership on the Internet.

Technology companies are increasingly adept at tracking products, our consumption of products, and even our personal movements.² The politics of doing so has in large part been left to them. It does not have to be so.

People Like Banks

People are comfortable and familiar with monetary banks. That's a good thing because without people willingly depositing their money into banks, there would be no banking system as we know it. Banks need access to people's money into order to make profits. Without a healthy monetary banking system our economies would be comparatively dysfunctional, and our personal lives would be critically deficient in opportunities.

The monetary banking system exhibits several key characteristics:

- **Security:** A physically safe place to store money. Also, government regulations insure continuity of deposits when banks go bankrupt.
- **Credibility:** Banks handle people's money like they say they will in order to continue maintaining and attracting deposits.
- **Compensation:** An important dynamic operates here. Banks compensate customers by paying market rate interest on deposited funds. In turn, the banks are compensated when they loan funds at higher market interest rates to third parties for financing consumer and commercial purchases.
- **Control:** Customers deposit their money, withdraw it or transfer it when they choose.



¹ The Fifth and Fourteenth Amendments to the U.S. Constitution both guarantee that people shall not be deprived of life, liberty or property, without due process of law.

² One need only look to the increasing usage of radio frequency identification (RFID), and the coming application of sensors employing nanotechnologies. For more about RFID, see footnotes 18, 21 & 22, below, and accompanying text. See also, 'Nanotechnology' at <http://wikipedia.org>.

- Convenience: Banks provide on-site tellers, off-site automatic teller machines and on-line Internet banking to increase on-demand access.
- Integration: Banks provide a critical component to a very complex web of communications involved in our everyday transactions. In the U.S., a strong central banking system, the Federal Reserve System, has been critical in that regard.
- Verification: By regulation and by practice, banks verify that monies deposited with them are legal tender and not counterfeit.

We are connected by the same integrated, information web of monetary banking whether we are purchasing medical services from a new physician, a steak from a grocer, or gasoline at the pump. When we fill-up with a tank of gas for say, \$35.62, the banking system precisely and efficiently facilitates the payment of that exact amount in a timely manner.

The Web As It Is

We live in a world that is at once awash in on-demand information courtesy of the Internet, and at the same time the Internet is strangely impotent when it comes to information ownership.³ Regarding information ownership, this paper depicts something more than legislated notification procedures for attempting to insure information confidentiality or information privacy. This paper also describes something more than the application of accepted standards for implementing information security.⁴ *Information ownership, for the purposes of this paper, refers to the effect of empowering information producers with the kind of granular control they have over depositing and spending their banked money.*

In many respects the Internet is like the Wild West because there is no information web similar to our monetary banking system. No similar integrated system exists for precisely and efficiently delivering our medical records to a new physician, or for providing access to a health history of the specific animal slaughtered for that purchased steak. Nothing out there compares with how the banking system facilitates gasoline purchases.

While our monetary banking system granularly processes the exact amount of the checks we write, the tools currently being used by information technology companies would imprecisely and inefficiently ‘pay’ for your \$35.62 tank of gas by cleaning out your entire bank account. Got \$3,434.99 in your checking account? That’s what would be ‘paid’, and then left up to the gas station to give you change for \$3,399.37.

If an analogy to the Wild West is *apropos*, then it is interesting to reflect upon the history of a bank like Wells Fargo, formed in 1852 in response to the California gold rush. Wells Fargo wasn’t just a monetary bank, it was also an express delivery company of its time for transporting gold, mail and valuables across the Wild West. While we are now accustomed to next morning, overnight delivery between the coasts, Wells Fargo captured the imagination of the nation by connecting San Francisco and the East coast with its Pony Express.¹ It is the central tenet of this brief paper that today’s Web needs information banks that do for the on-going gold rush on information what Wells Fargo did for the Forty-niners.

¹ See, generally, <http://www.wellsfargohistory.com/history.htm>

Many of us are familiar with online banking. We can view a fairly up-to-date status of our transactions, transfer money between accounts, and even pay our bills. Most of us are also familiar with online express package tracking. So, imagine monitoring in real-time the pathway and delivery of an express package (or a check), and the rights of those who handle information about that package (or check). Who has the right to use that information? Who is being sold that information for marketing purposes? What rights or access privileges to such information are in fact being sold?

Can our monetary banking systems serve as a model to make information less ineffective and more meaningful to our lives? If so, what is there to gain?

³ See “Welcome to the Semantic Web” by Tim Berners-Lee, *The Economist: The World in 2007*, p. 130.

⁴ “No amount of standardization is sufficient to ensure new data availability,” *Why Not One Big Database? Ownership Principles for Database Design*. Alostyne, M.V., Brynjolfsson, E., Madnick, S., MIT Sloan School (May, 1994).

What Are We Missing Without Granular Information Ownership?

In dealing with money, monetary banks have enjoyed the benefit of granularity. Whether a check is written for 1 penny, 1 thousand dollars, 1 million dollars, or more, the transactional process is the same. With information, it has heretofore been altogether different due to the absence of granular information ownership.

Take the gathering and delivery of your medical records to that new physician. Let's say that the physician needs only your health records for the last 10 years. What happens next? Her office becomes a dumping ground of confusing paper (or, practically the same thing, scanned images of medical information) from different sources, different specialties, and for time periods beginning with your birth. Suddenly, the physician is an information banker for your information whether she likes it or not. Granular information ownership holds forth the promise of a single, integrated system from which that physician may precisely draw.

Try using the Internet to trace back that steak to a specific animal, let alone find the health history of that animal, and you'll be stopped well before the farmer's gate, so to speak. There are two products being produced along our food chains today. One is the traditional food product, and the other is a newer informational product. The ownership of an animal may exchange hands a dozen times before it is slaughtered, and it may be transported to dozens of locations. But the absence of granular information ownership, and an information banking system which protects the information ownership of information producers, is a significant impediment to consistently and efficiently tracing back a meat product to an animal's birthplace.

And who owns – or should own – your gasoline purchasing habits, or your movements about town? Aren't these habits and movements part of your identity? What if you could arrange to deposit in real time your habitual use of the Internet, or your movements about town, into an information bank account? What if you could receive compensation for granulated sharing of that information with insurance companies doing risk analysis? Or, with large retail chains doing market analysis? Can you 'take back' your identity from the technology companies who are increasingly tracking your everyday purchases, travels and habits?

What if people could be provided with an information banking system with all of the key characteristics of a monetary bank plus the added technological feature of granular information ownership? What differences could it make for the betterment of our economies and our lives? To begin answering these questions, let's pause for a brief primer on what this paper means – technologically speaking – by granular information ownership.

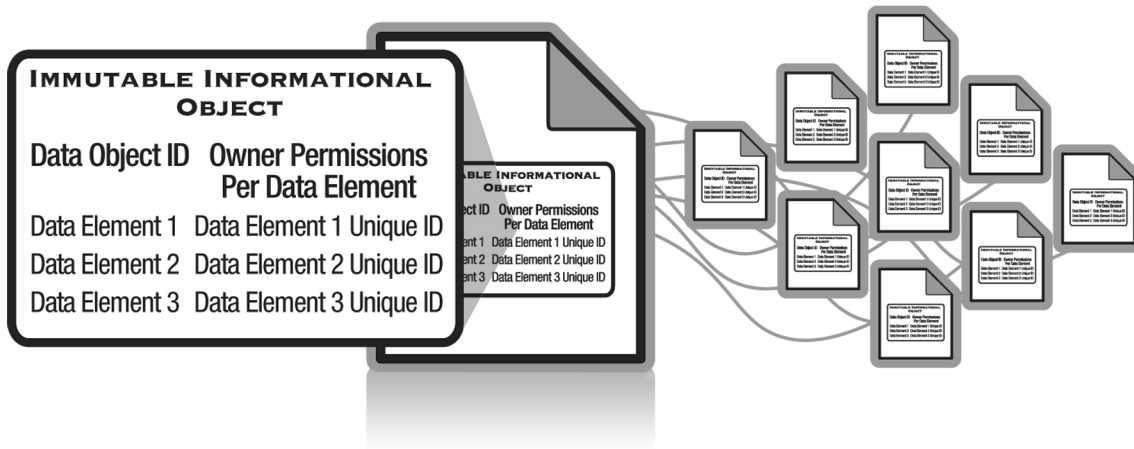
What Is The Technology Behind Granular Information Ownership?

Granular information ownership, as defined in this paper, empowers information producers with tools for authoring, maintaining and distributing Informational Objects or the granular components from which they are constructed. Using the everyday examples, above, these Informational Objects would be the information products authored by information producers along commercial or consumption supply chains like those for health care, food and energy consumption. From a technological standpoint, Informational Objects are products of object-oriented programming.

Object-oriented programming is a software programming paradigm that uses 'objects' to design applications and computer programs. In this paradigm an **Informational Object** is an individual unit of run-time data storage that is used as the basic building block of programs. These objects act on each other, as opposed to a traditional view in which a program may be seen as a collection of functions, or simply as a list of instructions to the computer. Each object is capable of receiving messages, processing data, and sending messages to other objects. *Each object can be viewed as an independent little machine with a distinct role or responsibility.*⁵

⁵ Source: Taken practically verbatim (with italics added) from Wikipedia's articles for 'Object (Computer Science)' and 'Object-oriented programming' at <http://wikipedia.org>.

An Informational Object could be a personal health record, a food safety report, or a monthly statement listing your gasoline purchases.



Depending on the type of report to which an Information Object pertains, the granular data elements from which it is authored (i.e., constructed) could be a social security number, a person’s birth date, a picture of a livestock brand, an animal’s genetic marker, or a single transaction of a gasoline purchase. What makes the data elements granular is that they can each stand alone as a single Informational Object controlled by the information producer. Yes, that would be an Informational Object comprised of a single granular data element.

Residing on the Internet, a granular information banking system would provide information producers with a centralized ‘dictionary’ of uniquely-identified, immutable data elements for the granular construction of uniquely identified, immutable Informational Objects. It would provide a set of software modules by which information producers could directly author, maintain and distribute their informational products as a whole, or in granular slices, to their customers, as integrated members of the system. These customers would be anybody from retail stores to government regulators to supply chain participants to insurance companies to physicians to hospitals to ‘you name it’.

With the appropriate permissions granted by deposit holders, these customers would be able to further retrieve, maintain and distribute these Informational Objects. The system’s interconnectivity would encourage the purchase and sale of informational products as *‘independent little machines’ that can remain highly controllable by the information producer even after the sale*. If this paper were longer, it would speak more to the *licensing* of information to customers for particular uses or for periods of times. But suffice it to say for now that the information producer can use Informational Objects to monitor (or otherwise audit) usage of the objects according to the terms of a sale.

Furthermore, a granular information bank could be architected as a single centralized database containing a ‘dictionary’ for constructing Informational Objects. Or, it could be an integrated network of databases all pointing to a single database containing a shared ‘dictionary’. The information could be internally constructed into Informational Objects and deposited within the granular information bank. Or, it could be imported from spreadsheets or other software applications and then re-constructed into Informational Objects for deposit. In either case, the common use of the same granular building blocks would drive construction standardization.

Granular Informational Object deposit holders would recognize the ownership of their informational products as similar to the banking of their money. Likewise, with permission granted by deposit holders, the granular information bank would ‘loan’ (i.e., sell or license) the deposited ‘funds’ (i.e., granular informational objects) to interested customers like marketing firms and retail chains. These integrated customers would also hold accounts within the granular information bank for the receipt of their ‘loaned funds’ in granular slices. If this paper were longer, it would discuss more the resulting opportunities for granular informational banking services revolving around such receiving accounts. Suffice it to say that a first step in the direction of such services is by the selling or licensing of more precise,

and cost affordable, granular slices of Informational Objects to receiving account holders instead of cleaning out a checking account to pay for a tank of gas, as described above.

The granular information bank would charge a market rate for these ‘loans’, and pay their deposit holders ‘interest’ for the use of the ‘funds’. Or, the deposit holder could preclude the ‘loaning’ of certain Informational Objects (e.g., those related to medical information) while at the same time still using the bank to granularly facilitate the processing of an informational bank ‘check’ written to a new physician. ‘Bank fees’ could be charged to either or both the deposit holder and the physician, also an account holder. On demand granular information banking statements would detail transactions, bank fees, interest paid on accounts, and fee discounts (or compensation) for granularly opting into advertising from specified companies or services.

What Is Different About Granular Information Ownership?

What is different about using Informational Objects for empowering granular information ownership that is different from what information technology companies are providing today? Granular information ownership, as described in this paper, involves an innovatively different application of Informational Objects than as mere individual units of run-time data storage.⁶ Granular information ownership is not an iterative step improvement in the use of Informational Objects, but is instead a paradigm shift in the application of object-oriented programming.

The reader may be familiar with collaborative document editing systems where multiple parties share in the creation of a single document.⁷ In contrast, granular information ownership is the creation of immutable Informational Objects without the necessity of any collaboration and, additionally with the critical use of a plurality of immutable data elements (each potentially acting as its own independent little machine) which are the granular components of the Informational Object.⁸ Furthermore, the immutable Informational Objects may be applied to the granular authentication, tracking and control of information products by the individual information producers along complex, owner-segmented supply chains.⁹ The sharing of hierarchically constructed – and fractionally owned – Informational Objects along such complex supply chains is a natural next step.¹⁰

The reader may be familiar with digital watermarking which is a software technique for adding copyright notices to digital audio, video or documents. By contrast, the application of Informational Objects radically exceeds the simple notification aspects of watermarking with on-demand, mechanical-like control by information producers following the sharing of their information products.¹¹

6 To that end, Pardalis’ patents have been distinguished by the examiners of the U.S. Patent & Trademark Office from Microsoft’s U.S. Patent #5,511,197 entitled ‘Method and system for network marshalling of interface pointers for remote procedure calls’ (issued April 23, 1996), Microsoft’s U.S. Patent #5,724,588 also entitled ‘Method and system for network marshalling of interface pointers for remote procedure calls’ (issued March 3, 1998), Microsoft’s U.S. Patent #6,493,719 entitled ‘Method and system for scripting for system management information’ (issued December 10, 2002), and IBM’s U.S. Patent #6,438,560 entitled ‘Reuse of immutable objects during object creation’ (issued August 20, 2002).

7 See, for example, Xerox’s U.S. Patent #5,220,657 entitled ‘Updating local copy of shared data in a collaborative system’ (issued June 15, 1993); “CrystalWeb – A Distributed Authoring Environment for the World-Wide Web” by R. Peters et al. (April 1995, pages 861-870); “DAPHNE – A Tool for Distributed Authoring and Publishing” by Z. Zhang et al. (October 1999, pages 1-15); and “Collaborative Multimedia Annotation Using A Centralized Document Server”, IBM Technical Disclosure Bulletin, IBM Corp., New York, US, Vol. 38, No. 9, September 1995, page 425.

8 See U.S. Patent #6,671,696 issued to Pardalis, Inc. entitled “Informational object authoring and distribution system” (issued December 30, 2003).

9 See U.S. Patent #7,136,869, Pardalis’ first continuation patent, entitled “Common point authoring system for tracking and authenticating objects in a distribution chain” (issued November 14, 2006).

10 “Common Point Authoring System for the Complex Sharing of Hierarchically Authored Data Objects in a Distribution Chain” (unpublished U.S. patent pending of Pardalis, Inc.).

11 See ‘Digital Watermarking’ in <http://wikipedia.org>. The U.S. patent examiners approving #6,671,696 and #7,136,869 have not even bothered to distinguish digital watermarking patents.

The reader may be familiar with digital rights management which is an umbrella term referring to any of several technologies for protecting the end-product of an artistic process (e.g., digital music, videos and movies).¹² Granular information ownership may be generally contrasted by its application to mechanically constructible non-artistic informational products (e.g., medical reports, food safety reports, gasoline purchase statements).¹³

The reader may also be familiar with advances in Extensible Markup Language (XML) such as with the Web Ontology Language (OWL). OWL is being developed with the intention of facilitating greater machine interpretability of Web content by providing core technical standards for finding, sharing and integrating information more easily.¹⁴ It is conceivable that to achieve the full potential of this framework, OWL would benefit from incorporating critical characteristics of granular information ownership as described in this paper.¹⁵

Suggested Practical Effects of Granular Information Ownership

Personal Health Records:

The old adage that ‘possession is nine-tenths of the law’ well applies to this field. Everyone – the hospitals, the doctors, the insurance companies, government agencies, consumer groups – claims to speak for the patients. There are many well-intentioned voices among these segments but who really speaks for the ‘property-less’ patients? America is in the middle of a political stalemate vis-à-vis the efficient collection, storage and sharing of medical records. Ownership begets political voice. A national information banking system that granularly empowers patients with technological portability and control – not just HIPAA¹⁶ confidentiality protections – over their own medical information would provide an opportunity for firing the imagination of patients that brings real political change. In this regard, our national, private *monetary* banking firms already have both a significant customer base and formidable technological infrastructure and know-how. Could they, with key partners from the medical community, introduce granular information banking services to their account holders and our national medical infrastructure at large? Granular data ownership is no silver bullet. But it may well serve as a catalyst for breaking up a political stalemate.

Food safety, etc.:

Information along the wonderfully complex beef supply chain is a largely wasted product. Despite the ‘mad cow’ scare of 2003, and despite the considerable efforts of the USDA¹⁷ since then, the federal government has so far been stymied in its efforts to introduce mandatory animal RFID¹⁸ for protecting the health of the nation’s herds. Many small beef livestock producers fear being put out of business by the prospect of costs imposed upon them for collecting and reporting information to the government about their livestock products. Others have balked over information privacy concerns despite legislated confidentiality protections. Still others have a strong, traditional preference to identifying their livestock with a branding iron. Here, too, the introduction of granular information ownership holds forth the promise of breaking up current and looming political controversies centering on information sharing and tracking in the beef industry. There is a wide-open opportunity for a major retailer, distributor or livestock association to commence a private, granular livestock information banking system that recognizes the rights of information ownership by small livestock producers, cuts through a morass of supply chain politics, and *virtually* integrates an owner-segmented supply chain for traceback in the event of a disease emergency. Incentivize the collection and preservation of animal identification information (whether by unique numbering or by branding with an iron), and

12 See ‘Digital Rights Management’ in <http://wikipedia.org>.

13 See an earlier Pardalis, Inc. white paper “Author-Level Digital Rights Management and the Common Point Authoring™ System: Protecting Information Exchange” (2004) available at www.pardalis.com.

14 See ‘Web Ontology Language’ in <http://wikipedia.org>.

15 OWL is seen as a major technology for the future implementation of a Semantic Web which is Tim Berners-Lee’s vision of the Web as a universal medium for data, information, and knowledge exchange. See generally <http://www.w3.org/>.

16 The Health Insurance Portability and Accountability Act (HIPAA) enacted by the U.S. Congress in 1996.

17 United States Department of Agriculture.

18 Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. An RFID tag can be attached to or incorporated into a product, animal, or person for the purpose of identification using radio waves. Source: <http://wikipedia.org>.

other life history information,¹⁹ with retail store discounts, ‘mad cow’ insurance, or an opportunity for livestock producers to earn extra dollars for both their livestock products and their information products. Empower even the smallest livestock producers with the choice of granular control over the ‘chapters’ they ‘author’ about the animals they produce, then see if animal identification isn’t more palatable.²⁰

Product Tracking:

In August, 2003, Wal-Mart, the world’s largest retailer, issued a standardizing mandate to its suppliers to begin preparation for putting RFID tags carrying Electronic Product Codes²¹ on pallets and cases. Notwithstanding these kinds of market pressures, the best bet for deploying RFID (and reaping a return on investment) is to begin “with a case-level tagging program aimed at improving operations close to the retail end, such as receiving, handling and storage”.²² Information banking has so far not been of interest to vertically integrated product supply chains because in such chains there is essentially only one information owner, and the information sharing mechanisms provided by enterprise systems have been sufficient. The challenge, as mentioned above regarding the tracking of livestock and their by-product meats has been the sharing of information along complex, owner-segmented supply chains. This is where information banking has essential value because without it *no amount of standardization will be sufficient to ensure new information availability along such supply chains*.²³ As with livestock products, a major retailer, distributor or trade association could initiate a private, granular information banking system focusing on their supply chain interests.

People Tracking:

Ubisense, an international company with offices in the UK, US, Germany and Singapore, promises to deliver a three-dimensional, real-time location system utilizing ultra-wideband RFID technology that locates assets and people within six cubic inches.²⁴ Somark Innovations, a St. Louis, Missouri startup company, claims to have successfully tested biocompatible RFID ink which can be read through animal hairs. Somark plans to license its technology to markets focusing on laboratory animals, dogs, cats, prime cuts of meat, and military personnel.²⁵ Researchers in the SENSEable City Laboratory at the Massachusetts Institute of Technology have been testing anonymised data from two European mobile phone companies to analyze where mobile phones (and therefore people) are at any given moment.²⁶ People tracking is a technological reality but to what extent will it be politically accepted? Are our individual movements any less personal than our personal health records? Who owns the data to be mined? Information ownership – as a political issue – is self-evident. Perhaps mobile phone companies are as well positioned as anybody to originate private granular information banking in this sector.

Transactional Tracking:

Our online transactions, and our general use of Internet search engines, all leave a ‘click trail’ that says much, and precisely so, about the products we consume. Money is currently being made by search engines, information aggregators and other data mining operations in collecting and selling our personal information profiles to marketing companies, retail stores, etc. Companies like the Attention Trust²⁷ or Boxbe²⁸ plan on empowering Internet users to

19 Genetic information, animal movement information, veterinary pharmaceutical information, animal welfare information, etc.

20 See also the earlier Pardalis, Inc. publication “A New Information Marketplace for the Beef Industry: A White Paper Introducing Common Point Authoring” (2004).

21 The Electronic Product Code (EPC) is a family of coding schemes for RFID tags. It is designed to meet the needs of various industries, while guaranteeing uniqueness for all EPC-compliant tags. Source: <http://wikipedia.org>.

22 See ‘In Search of RFID’s Sweet Spot’, The Wall Street Journal, The Journal Report: Business Insight, By Sunil Chopra and Manmohan S. Sodhi, March 3, 2007.

23 See “Why Not One Big Database? Ownership Principles for Database Design.” Alostyne, M. V., Brynjolfsson, E., Madnick, S., MIT Sloan School (May, 1994).

24 See <http://www.ubisense.net/>

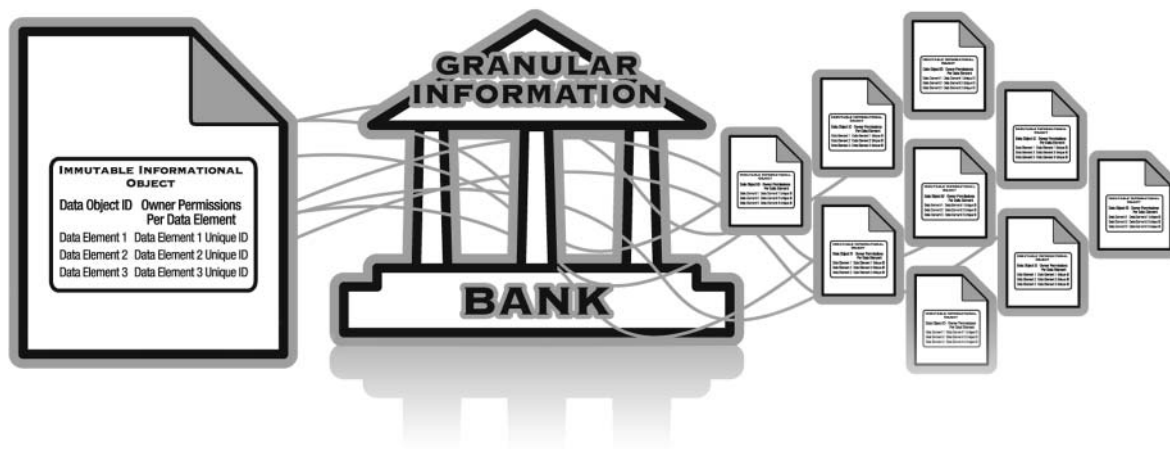
25 See <http://www.somarkinnovations.com/>

26 See ‘Go with the flow’, The Economists Technology Quarterly, March 10, 2007. See also <http://senseable.mit.edu/>.

27 See www.attentiontrust.org.

28 See www.boxbe.com.

directly collect and vault their own information for sale by themselves thereby permitting the actual information producers to reap more value from their information products.²⁹ This is a positive development, and it will be interesting to see whether, and how well, it will be accepted without further empowering granular data ownership in the hands of the information producers. It is worth noting, again, the difference that granular information ownership provides is in the creation of granular documentation which is controllable by information producers beyond the ‘one off’ sale of information. The use of Informational Objects makes information more tangible, more like a commodity, and more like a ‘real’ product. *The critical goal is to provide information producers with control that they recognize as ownership even after depositing their information into the hands of a third party.*



It's Time For A Technological *and* Political Change

There is a quagmire at the intersection of the competing needs for global information transparency and confidential information ownership. Granular information ownership matters because it holds forth the promise of empowering people with much more technological and political control of their information than that provided by conventional information technologies and legislated confidentiality protections.

Give people the opportunity to profit or otherwise benefit from their information products in the form of granular Informational Objects, and their valuable information will become more accessible to all. Give people the opportunity to familiarly bank their information like they bank their money, and watch the political dynamics shift favorably toward a more information transparent, and information secure, world.

First, there was money. Then there came the banking of money. Now is the time for the Information Age to shift into an Information Banking Age full of new services, and new opportunities, not unlike those brought to us, and facilitated by, our very successful monetary banking systems.

²⁹ See ‘Working the crowd’, The Economist Technology Quarterly, March 10, 2007.

About Pardalis, Inc.

Pardalis' mission is to promote the sharing of confidential, trustworthy and traceable data along complex and poorly coordinated supply chains with innovative Common Point Authoring™ methods for protecting the ownership rights of information producers. For information about licensing intellectual property or systems, call 877-OWN-DATA or visit <http://www.pardalis.com>.

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