Optimizing Knowledge Yield in the Digital Workplace

A new system design for thriving in the data-intensive universe

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1. Abstract

Kyield is a recently patented system that can provide individuals, groups, and organizations the ability to tailor the quality and quantity of data to their specific needs in a continually adaptable manner, thus enabling yield management. The Kyield system represents a breakthrough in management of data in the digital workplace environment.

When deployed system-wide in organizations, Kyield can be accurately described as a complex adaptive organizational operating system (CAOOS).[1] [2] Kyield has similarities to the human brain in managing neural networks, although in comparatively primitive form.

The purpose of this paper is threefold. First, it briefly describes how the digital workplace evolved in an incremental manner. Second, it discusses related structural technical and economic challenges for individuals and organizations in the digital workplace. Lastly, it summarizes how Kyield's novel approach can serve to provide exponential performance improvement.

2. Background

The patented Kyield system has roots in empirical research in our live lab and incubator during the mid-1990s where we began working towards answering the question:

> *What would be required to achieve yield management of knowledge in the increasingly globally networked, human-computer environment?*

Our ensuing hypothesis argued that multiple obstacles in IT could best be overcome with a new holistic architecture that was continuously adaptable, without which given the complex challenges in network computing, solutions to individual technical and economic challenges were improbable.

We tested several of the components of the system successfully in our Arizona lab prior to filing the initial patent application in 2006.[3] The primary remaining technical risk was in scaling the structured data required by the largest organizations in near real-time, which has since been achieved in comparable scale by several labs employing a variety of methods.

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[1] Gell-Mann, Murray (1995). "*The Quark and the Jaguar: Adventures in the Simple and the Complex*". St. Martin's Griffin ISBN: 978-0-8050-7253-2.
[2] Montgomery, Mark (2011). "A Semantic Enterprise Operating System". Kyield.
[3] Montgomery, Mark A. "Modular system for optimizing knowledge yield in the digital workplace". Patent 8,005,778 23 August 2011.

3. Impact of Incremental Innovation in Computing

IT systems incrementally transitioned from the Intranet and desktop era to the Internet environment as a collection of rigid, incompatible data structures and complex software applications.

A result of incremental IT systems evolution has been the rise of desktop computing with proprietary standards, driven by demand for interoperability and a common user interface. While ubiquitous computing provided an initial spike in efficiency and productivity, and helped lower hardware costs, the commoditization has come with consequences for organizations, knowledge workers, and regional economies, contributing to economic stagnation and insecurity. Impacts include lack of differentiality in the digital workplace, difficulty in achieving a competitive advantage, and inability to adapt to constantly changing technical, economic, and creative environments in an affordable manner.

A second byproduct of incremental IT systems development include data silos and business models that contribute to systemic dysfunction, cause barriers to innovation, accelerate economic imbalances, and result in frequent litigation. A large, profitable, global industry has emerged with an ecosystem that thrives from incompatibility and need for integration with high ongoing maintenance fees, reflecting a model that is often compared to a global government tax, with a similar culture, levels of innovation, and resistance to change.[4] [5]

A third byproduct of incremental computing has been to contribute to weak security in the network environment, little protection of original work products, and lack of accountability, challenging the most advanced forensic investigators after the fact.[6]

The situation in enterprise computing has been viewed by some as a technical challenge and business opportunity through more revolutionary systems in mobile and cloud computing with more proactive strategies and tactics by customer organizations.[7]

4. Economic Challenge with the 'Free' Web

With the commercialization of the World Wide Web, it quickly became apparent that the Web's architecture lacked sufficient structure to achieve the functional and economic potential of the medium. Researchers in computer science therefore embarked on a path towards a more structured, intelligent version coined the Semantic Web.

In conventional consumer search, results are dependent upon key words, links, and tracking user behavior based on algorithmic probabilities that cause serious data privacy issues. While much improved since the early days of the Web, consumer

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[4] Carr, Nicholas G. (2004) "*Does IT Matter?*". Harvard Business Press ISBN-10: 1591394449.

[5] Weier, Mary Hayes (January 4, 2009). "Software Maintenance Fees: Time For This Model To Change?" *InformationWeek*.

[6] Markoff , John (February 14, 2009). "Do We Need a New Internet". *New York Times*.

[7] "Jeff Bezos' Risky Bet" (November13, 2006). *Businessweek*.

search has proven less than optimal for mining essential data.[8] The free medium is dominated by a powerful network affect, supported by e-commerce and advertising revenue models, which combined cannot sustain the majority of content providers or the higher level technical work required of the interactive digital medium, nor has it yet provided new opportunities for displaced workers.

The result has been a small number of companies located in a few metro areas that have profited greatly at the expense of large numbers of workers and regional economies across the world. Economies have shifted globally in part due to historic levels of subsidies, including through direct investment, tax, currency, and content. While the cost of computer servers and data storage have continued to plummet, the cost of living for humans has risen, causing a serious imbalance that has yet to be addressed by science, technology, business or public policy.

5. Web Standards Model

The voluntary standards bodies for the WWW, which increasingly impact the global economy in both what is achieved and what is not, is represented primarily by a small global community within one academic discipline (CS). The approval process requires consensus of entities to include members who have business models that are threatened by any standards other than their own. No enforcement power exists beyond national laws, which vary greatly.[9] [10] While the governance model for the consumer Web has been to some degree self-defeating, the voluntary approach is an improvement over the monopoly in the desktop era in terms of economic diversification and market competition. Adoption of semantic standards has been relatively strong in the enterprise with more recent adoption of RDFa on the consumer Web.[11] [12] An interoperability convergence of data standards and functionality is beginning to occur regardless of device, entity type, or location.

6. Current Situation in the Digital Workplace

Owners of data are substantially reliant on conflicted parties to access and manage their own data; internally in the enterprise and externally on the consumer Web, despite the revolution in computing where data increasingly reflects everything deemed of material value. I argue that whether in the enterprise, consumer Web, or mobile, the lack of data control by data owners is increasingly self-defeating for global business, trade, and economics. The legacy business model conflicts in IT serve as an impediment to creation and adoption of products and services that are essential to overcoming structural economic challenges, including improved learning systems, crisis prevention, healthcare efficiency, and government efficiency, all of which are cited regularly by business leaders as causal factors for substantially increased uncertainty, risk, costs, and lost opportunity.[13]

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[8] Han, Jiawei; Kamber, Micheline; Pei, Jian; (2011). "*Data Mining: Concepts and Techniques"* (3rd ed.) Morgan Kauffmann ISBN: 9780123814791
[9] Johnson, Bobbie (November/December 2010). "The Web is Reborn". *Technology Review*.
[10] Anderson, Chris; Wolff, Michael. "The Web is Dead, Long Live the Internet" (August 17th, 2010). *Wired*.
[11] Macmanus, Richard. "How Best Buy is Using the Semantic Web" (July 1st, 2010). *ReadWriteWeb*.
[12] beta620; "Experimental Projects From The New York Times".
[13] "The Global Business Competitive Report" (2011-1012). World Economic Forum.

In the enterprise, individuals and business units are trending towards dealing directly with cloud and SaaS vendors rather than internal IT departments, while more sophisticated internal IT departments are building customized systems for competitive advantage.[14] Knowledge workers are increasingly demanding choice for mobile devices even if personally acquired for convenience and efficiency. SaaS vendors are growing much faster than incumbents, which are demonstrating stiff resistance throughout their ecosystems to voluntary cannibalization of outdated innovation and business models due to historic profit levels.[15]

7. How Kyield Can Help

While Kyield does not claim to resolve all of the IT challenges presented in this paper, our IP and related trade craft in our systems approach can overcome multiple interconnected issues while laying a foundation for solving many others at the confluence of computing, economics, human systems, and organizational management.

a. Managing the digital enterprise

The 'brain' of the organization is the CKO (Chief Knowledge Officer) module which has administrative settings for applications that define relationships between entities, establish system rules, set security policies, and provide performance guidelines.[16] The adaptability is essential for achieving the mission of knowledge workers and organizations while enabling continual improvement.

The group and individual modules are also continuously adaptable with the ability to provide greater granularity down to the individual for managing relationships, data quality, and volume within the parameters established by the CKO module. The deep semantic intelligence with performance menus provide for strong alignment and improved meritocracy, which increases work quality and productivity. We believe early adopters of Kyield will have multiple unique competitive advantages.

b. Data quality and quantity

My core patent simulates data 'valves' for automated quantity and quality. Each module is adaptive and can be optimized in full automation mode or with more precision in manual mode. Embracing of standards allows for simple plug-in of applications for modeling, ratings, and algorithms that tailor applications to the specific needs of each individual, group, and organization as changing conditions and needs warrant. This infrastructure provides the basis for overcoming most of the challenges in the digital workplace environment.

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[14] Nash, Kim S (August 29th, 2011). "The Secrets to Successful Software Innovation Projects" *CIO*.
[15] Podcast interview with Bob Herbold (September 9th, 2011). *Puget Sound Business Journal*.
[16] Montgomery, Mark; Borland, Russell (November, 2008). "Unleash the Innovation Within". Kyield.

c. Human performance and data currency

The weakest links in the digital workplace environment are the absence of individual accountability, data security, human performance system engineering, and associated misalignment of interests between entities found in each human caused systemic crisis I have studied. Given that data increasingly reflects essentially all material value, the larger structural problems in the digital workplace and broader economy can only be overcome with data owners maintaining control over their own data. Data is in fact already a type of currency that reflects most other currencies. Data must be structured properly for self-management, entity management, valuation, and exchange. Kyield provides a cornerstone for accountability, human performance engineering and data currency, which must be conjoined in the digital workplace environment.

d. Data profile presentation vs. search

With Kyield, relevant data 'finds' and presents itself to knowledge workers automatically based on semantic intelligence, or meaning, as defined by a combination of original work products and knowledge worker profiles tailored to individual needs by organizations and individuals. In the CKO module, clients select from menus of data models and algorithms based on their needs, not as selected by the needs of search engine computer scientists constrained by partial indexing and/or an advertising model.

e. Crisis prevention

One driving motivation throughout our 15 years of R&D has been to improve technology and methods for more effective crisis prevention. I see the greatest near-term value to society and clients when Kyield is deployed in large organizations that have experienced internal systemic crisis or network contagion, and/or are at risk of same. Our research has revealed actual cases of human caused crises that would have been prevented or substantially mitigated with our system, resulting in direct savings ranging from the low billions of dollars by catching mislabeling of products prior to shipping, to well over $1 trillion in intelligence and finance.[17] [18]

f. Invention, discovery, and innovation

While value is more difficult to quantify in advance than crisis prevention, another priority for Kyield has been to expedite scientific discovery, invention, and innovation. The innovation process can be expedited with our patented architecture by combining yield management of data quality and quantity with performance menus and rich visual metrics. Considerable trade craft is involved in the creation and selection of models and algorithms that seek to optimize differentiation and performance, which can be tailored to each entity and relationship from macro global down to each individual. Importantly, embracing of universal standards enable low friction plug-ins.

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[17] "Tenth Anniversary Report Card: The Status of the 9/11 Commission Recommendations" (September, 2011). *National Security Preparedness Group*.
[18] "Levin-Coburn Report on the Financial Crisis" (April 13th, 2011). U.S. Senate.

g. Personalized medicine

After many years of study, we began working on our healthcare platform, resulting in our diabetes use case scenario published in 2010, which has since been downloaded by most leading healthcare organizations worldwide.[19] [20]

The life science industry cluster was an early adopter of structured scientific data, which will enable compressed discoveries and higher efficiency once the healthcare delivery and organizational systems convert to structured data, mobility, and transform to patient-centric, interoperable platforms.[21]

The obvious solution to the macro economic challenge in healthcare is to empower the patient, remove economic disincentives for lowering overall healthcare use throughout the ecosystem, and provide incentives to improve prevention through self-managed care. My recent patent and our associated trade craft are ideally suited to the technical challenges facing healthcare.

h. Personalized learning

The transdisciplinary field of knowledge systems is ultimately focused on optimization of human learning, which has many applications across our society. With ubiquitous computing, continuous learning tailored to the individual is not only possible, but I and many others argue is increasingly essential in the hyper-competitive global economy. [22] [23]

The Kyield system is based on my theorem originating in our KS lab in the 1990s 'yield management of knowledge'. The design for achieving yield management of knowledge is substantially represented in my recently issued USPTO patent #8,005,778.

From claim #3:

> *Consists of a software module (that) determines the security and regulatory settings for said system, creates and manages global curriculum and courses for members, and determines which messages are mandatory versus optional*.

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[19] Montgomery, Mark (May, 2010). "Diabetes and the American Healthcare System". Kyield.
[20] International Diabetes Federation (September 13, 2011) "New IDF data reveals diabetes epidemic continues to escalate". Press Release.
[21] Halamka, John D. (September 1, 2011). "The Rise of Electronic Medicine". *Technology Review*.
[22] Pines, David (April, 1998). "Designing A University For The Millenium: A Santa Fe Institute Perspective". Santa Fe Institute.
[23] Drucker, Peter F. (January, 2005). "Managing Oneself" *Harvard Business Review*.

From claim #5:

> *Consists of a software module a business unit designate employs to create and manage courses for each individual member within the group or community, sets the initial messaging volume and quality levels, determines which messages are mandatory versus optional, selects content reviewers, and defines the default search parameters according to the group and individual objectives.*

From claim #7:

> *Consists of a software module whereby each individual member manages the quality and quantity of their personal information consumption in messaging and search returns.*

8. Conclusion

Whether employed in a virtual organization, independent contractor, global enterprise, patient-centric healthcare organization, life-long learning process, or computer-assisted and extended classroom, the basic requirements for achieving '*yield management of knowledge*' in the digital environment are much the same:

- Logically structured, interoperable data
    - Pathway to improved security
    - Pathway to data currency/exchange
    - Pathway to improved economic models
- Self-managed 'profiling'
    - Data owner controlled
    - Protection for original work products
    - Tailored data retrieval/find
    - Automatic data presentation
        - Visually rich metrics
- Precise data governance
    - Properly managed entity relationships
        - Automated prevention alerts
        - Routine data auditing
        - Hierarchical and peer security
- Easily managed data volume *and* quality
    - 'Auto pilot' option
    - Manual override
- Frictionless application plug-ins
    - Menu variety for:
        - Modeling
        - Algorithms
        - Performance ratings
- Easily adaptable for continuous improvement
    - Native languages, simple to use

Our approach represents a breakthrough at the confluence of computing and organizational management that has the capacity to prevent human-caused systemic crises, substantially expedite discovery, and significantly improve human performance. However, Kyield provides only the management of data which must be served, routed, processed, consumed and stored through a variety of devices and infrastructure across local and global networks, requiring constant vigilance, partnering, and a functional standards process.

While it has taken 15 years of persistent R&D to reach the milestone of the initial key patent and adoption of underlying technologies that allow for optimization of data that makes yield management in the digital workplace possible, we are just at the beginning of what we hope will be a permanent, sustainable voyage of continuous improvement in human learning, decision making, accountability, and performance.

> *"Kyield is patented approach in the directions of valuing, managing and leveraging an individual's, group, or organizational knowledge. It treats knowledge as "capital"; a factor of production in a knowledge-based economy*". –Dr. Robert Neilson