



What is an EAI OS?

And why they are becoming essential

Introduction

In this executive briefing we'll explore enterprise operating systems enhanced with AI (EAI OS), why they are becoming essential, and how the entire organization can benefit from a well-governed, low-risk, unifying, and cohesive AI system.

When we first started the KYield voyage, we had no intention of designing an EAI OS. The original idea was 'yield management of knowledge' in the digital workplace.

It wasn't until the early 2000s when designing a system that had the capacity to execute the theorem when I realized the what I was designing was an operating system augmented with AI, so I began calling it the KYield OS (later abbreviated as KOS), which to my awareness was the first EAI OS.

Not to be confused with a computer OS, an EAI OS is an organizational OS that should seek to unify the distributed work environment and culture, include easy-to-use governance that is adaptive to changing needs, provide strong security, accelerate learning, and embed enhanced productivity across the digital workplace.

We introduce a new twist on an old concept in complexity science in this paper regarding how to manage complex adaptive organizational systems (CAOS). In order to manage chaos in an ever-changing world, including occasional black swan events, organizations first need to embrace CAOS. One of the benefits in so doing is to achieve a continuously adaptive learning organization (CALO), which begins upon adoption of our KOS.

One example of the need to adapt is the work from home phenomenon, which was dramatically accelerated by the COVID pandemic. Even a small percentage of employees working from home or in hybrid form has profound implications for office owners, their lenders, cities, and business.

"The leadership challenge of our decade is: if you want them all to feel part of something bigger than themselves, how do you bring that together in a way that seems both fair and productive?" – Dave Ricks, CEO of Eli Lilly, in *The CEO Daily* newsletter by Alan Murray, CEO of *Fortune*.

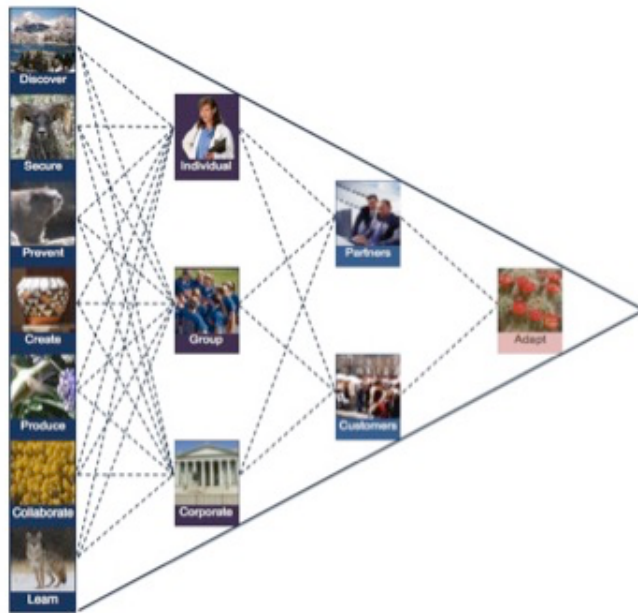
Fortunately, we are now in a position with the emergence of the EAI OS to greatly improve fairness and productivity in the digital workplace, among other values, regardless of physical location (see our previous paper and video [introducing generative AI](#)).

Although the pandemic painfully demonstrated the need for organizations to be highly productive and adaptive over networks, the use cases are essentially infinite from a pragmatic perspective as we couldn't possibly document the majority. I hope you find our insights to be of value, and I look forward to discussing.

Sincerely,

Mark Montgomery
Founder & CEO
KYield, Inc.
<https://kyield.com>





KYield OS: Inspired by. Managed by Humans. Assisted by AI

Table of Contents

Introduction	1
Different Types of EAI OS	3
Complex Adaptive Organizational System (CAOS)	4
EAI OS Architecture.....	5
Security Differentiation Sovereignty.....	6
Continuously Adaptive Learning Organization (CALO).....	7
Discussion & Conclusion	8
References	9



2018 discussion on a unified EAI OS



2023 talk walking through this paper



Different Types of EAI OS



For those just discovering the concept of an EAI OS, it may be surprising to discover that the concept of an AI OS dates back decades for computers. For understanding an EAI OS, it helps to differentiate between a computer OS and business OS, then consider combining them in a networked environment enhanced with AI.^{1,9}

“Can we build an operating system that is really 'intelligent'? What would such an intelligent system do? How would it act? Would it be different? An adaptive system..... Would it be better?” – Brett Fleisch, 1983.²

Dale Tonogai at UC Berkeley conceived of an expert scheduler for algorithms in an OS in 1988, which still has relevance today for automating algorithms.³ In researching this paper we just discovered an AI OS from 1991 by Jean-Claude HEUDIN called the KOS, which was a knowledge-based OS for real-time AI to assist fighter pilots.⁴ In 1994 a team of researchers (O Etzioni et al., 1994) considered a goal-oriented approach using AI techniques and agents.⁵

One of the more notable examples for a business OS in recent years was when Doug McMillon, CEO of Walmart, said “we need a new operating system”.⁶ More recently Intuit has adopted a vertical AI OS with GAI functionality for their highly specialized accounting and tax software business: “Think of a real operating system, like MacOS or Windows” “I think this is a revolutionary idea.” – Ashok Srivastava, CDO at Intuit⁷

Vertical OS

A vertical OS is focused on a specific industry or deep specialty, and is substantially automated. Joe Schmidt and Kristina Shen at Andreesen Horowitz recently described a vertical OS as follows: “there can only be one vertical operating system for a business. The OS layer stitches together various systems of records and becomes the place an employee spends the most time completing daily activities...it runs the workflows for the entire company.”⁸

Organizational OS

Carlos Páscoa and José Tribolet describe the need for an Organizational OS in their 2015 paper: “Organizations are dynamic systems that run in complex environments and need to react to changes, by increasing its self-awareness and its ability to transform and adapt. Failure to adapt can lead to disruption. Adaptation mechanisms need to consider the wholeness of the organization to maintain its viability and performance”.⁹

Non-Humancentric OS

An example of a non-humancentric EAI OS is a pure computer or network EAI OS that doesn't involve much human interaction beyond administration and monitoring, such as a fully autonomous OS for drones, a router network, or for robotic process automation.¹⁰

Complex Adaptive Organizational System (CAOS)



Although the COVID pandemic provided an extreme example of why the ability to adapt is essential, complexity has increasingly become a factor even in relatively normal times free from crises.¹¹ It's a play on words but nonetheless true that the degree of success a company enjoys will depend on how well they can manage through chaos in an ever-changing world by creating or adopting a competitive CAOS, which today requires a very well designed EAI OS.

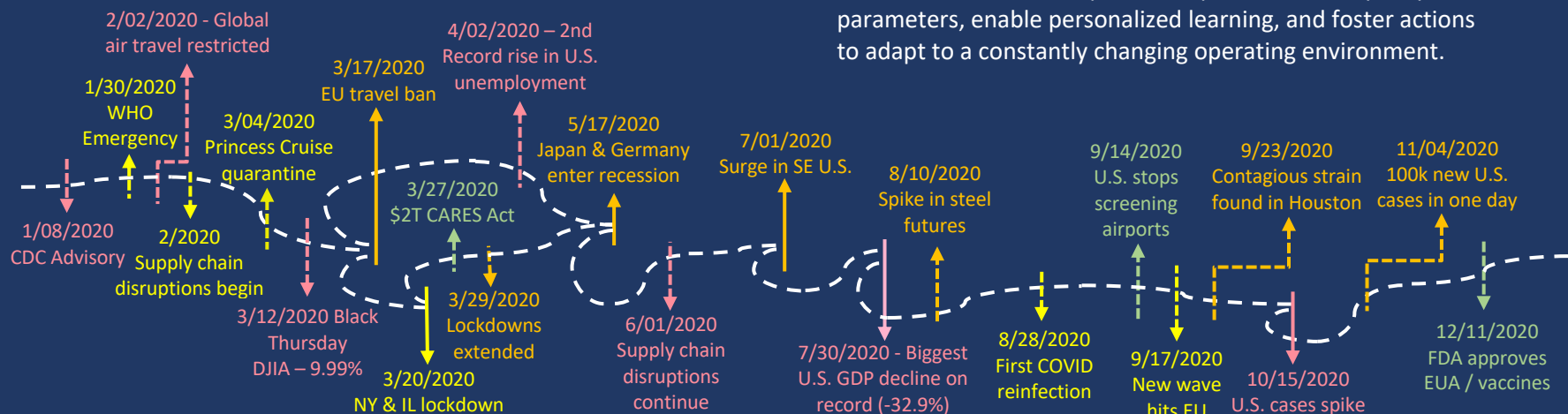
An article at MIT SMR (Reeves, et al., 2017) describes the complex operating environment facing modern leaders:

“These ecosystems are nested complex adaptive systems: multilevel, interconnected, dynamic systems hosting local interactions that can give rise to unpredictable global effects and vice versa. Acknowledging the unpredictability, nonlinearity, and circularity of cause-and-effect relationships within these systems is a notable departure from the simpler, linear models that underpin traditional mechanistic management thinking.”¹²

Research in complexity for organizational management and business is not new.^{13,14,18} When I was a frequent guest at the Santa Fe Institute (SFI) from 2009-2015, they had a robust business network with dozens of members, which had been operating for many years.

Founded in 1984, SFI is considered the world's leading center dedicated to complexity research. Top scientists from around the world visit SFI while writing books or to present new research in many disciplines, including computer science, mathematics, physics, biology, life science, sociology, and economics. It was an ideal environment to mature our KOS and work on the synthetic genius machine (SGM).¹⁵

In an attempt at extreme reductionism, our KOS is an executable CAOS that evolved into an EAI OS during R&D. We intentionally allowed evidence to guide our system design in the simplest form possible. We provide the governance structure (CKO Engine) necessary to manage a CAOS within varied compliance requirements and policy parameters, enable personalized learning, and foster actions to adapt to a constantly changing operating environment.





EAI OS Architecture



A Minimal EAI OS

As the previous pages indicate, enterprise AI requires high performance systems architecture and advanced engineering. However, multiple levels of quality are possible, and to some degree already exist in partial systems.

The five most important essentials to achieve a minimal EAI OS:

1. A well designed, end-to-end enterprise data management system (DMS). The DMS should be highly refined and include the workflow of the organization. High quality data in parts of the organization does not provide an EAI OS, but may be integrated with an EAI OS.
2. Quality and accuracy of AI outputs depend on the quality and accuracy of the inputs. The effectiveness of the EAI OS will largely depend on the precision and accuracy of the quality of work and quality of data within the organization.
3. An EAI OS is classically transdisciplinary. Human systems, for example, are critically important and represent a significant portion of our R&D (related components represent about 40%).¹⁹ Finding the appropriate talent and knowledge in a single designer or team is among the greatest challenges.
4. The EAI OS UI must be simple to use, engaging, and well aligned to the interests of the workforce. Tacit incentives should be made explicit.
5. An effective EAI OS that is compliant with regulations and corporate policies requires a functional governance system, which requires a rules-based semantic data structure.

An Optimal EAI OS (KOS)

The KOS is a data-centric and human-centric EAI OS with a flexible modular design. Hybrid cloud design is automatically tailored to the needs of each entity. *

The KOS modular architecture was designed with integrity to be instantly operational. The two primary components of the KOS are as follows:

- CKO Engine
 - Provides easy-to-use governance for the entire EAI OS, including access to subordinate CKO Engines and DANA (digital assistant), security, curriculum, and policies
 - Organizational semantic data structure and knowledge systems granularity
 - Multiple types of security and prevention
- DANA (Digital assistant with neuroanatomical analytics)
 - ◆ Personalized learning
 - ◆ Selective knowledge sharing
 - ◆ Prevention of crises
 - ◆ Prescient search
 - ◆ Work-related networking
 - ◆ Personalized wellness programs
 - ◆ Messaging
 - ◆ Generative AI

* Based on our 15 EAI management principles (executable with the KOS).



EAI Security

Due to large language models (LLMs) combined with poor data quality, generative AI (GAI) in particular is inherently insecure, and is creating new threat vectors.

One cybersecurity firm reports that 4.7% of employees have already pasted confidential information into ChatGPT. Any data stored LLM chatbots will become part of the automated output, including confidential information. Although our greatest concern for catastrophic risk in GAI continues to be biowarfare, the risks are many in AI across the enterprise.

KYield was an early proponent of zero trust architecture. The KOS includes multiple types of security, including:

1. Enterprise-wide access control with data-centric security via the admin functions in the CKO Engine
 - a. Verification all individuals (employees/contractors)
 - b. Approval for network connections
 - c. Control over subservient KOS via CKO Engines (partners, subsidiaries)
 - d. Consistent with zero trust policies
2. Relational security
 - a. Behavioral analytics
 - b. Pattern recognition
3. Encryption
 - a. Rivest-Shamir-Adleman (RSA)
 - b. Advanced Encryption Standard (AES)
 - c. Proprietary neurosymbolic encryption (R&D)

Differentiation

One of the greatest challenges facing CEOs in developing an effective AI strategy is how to differentiate in a competitive manner. The ubiquity that provides relatively low costs and interoperability in IT also results in commoditization and lack of competitive advantage. I call this the IT commoditization paradox.

In order to achieve a competitive advantage, organizations have increasingly invested heavily in customization on top of large investments in commoditized IT. With instant commoditization of consumer LLM chatbots, it's never been truer that an organization's competitive advantage is their people, reflected by their data.

The KOS provides the ability to easily tailor functions to the needs of each entity with a simple-to-use natural language interface, enhancing differentiation. The work process in DANA (digital assistant) creates high quality data to power ML functions, including GAI. The goal is to rapidly achieve a continuously adaptive learning organization that provides a sustainable competitive advantage.

Sovereignty

Increasing numbers of companies are subsidizing competitors in tech vendors. To avoid a collapse in stock price and reversal of profit trajectory, tech companies must continue to grow, which increasingly requires competing with customers. KYield employs methods to defend customer sovereignty and security, including hybrid cloud, and data architecture that can be transferred between databases and datacenters. We also provide some services on devices.



Continuously Adaptive Learning Organization (CALO)



“The only sustainable competitive advantage is an organization’s ability to learn faster than the competition” – Peter Senge

Failing to Act on Lessons Learned

Research over decades has revealed that organizations often fail to act in time on critical lessons learned. Even warnings by domain experts with highly specific and actionable intelligence have been ignored, which if acted upon in time would have prevented major catastrophes.

This phenomenon has been repeated consistently over the decades, resulting in hundreds of billions of dollars of preventable losses in the private sector, and tens of trillions of dollars in the public sector, as well as large numbers of lives lost.

History has made it quite clear that individuals, organizations, and nations that learn more rapidly and take the appropriation actions based on evidence become more successful. Those that don’t often rapidly decline relative to the competition. There is little doubt then about the importance and value of learning, and the need to take appropriate actions. The question is what type of systems enable the most optimal learning environment and achieve the best outcomes.

We started the KYield voyage while operating the leading learning network for thought leaders, which included professors, analysts, and executives from most of the world’s most successful organizations. Twenty-six years of R&D later we’re confident the KOS represents the best option given the current state of technology and human evolution.

KOS Learning Components

High quality data

DANA allows individuals to post high quality content by file or link. Every file is rated and included in the recommendation system. DANA presents personalized content to each individual based on detailed profiles.

Curriculum

The CKO Engine offers organizations the ability to deliver curriculum in a precision manner for personalized learning, whether developed internally or from external sources.

Professional networks

DANA provides a strict work-related networking function, and employs knowledge graphs for enhanced learning, visual network management, risk management, and productivity.²⁰ Governance is shared between the CKO Engine and DANA within policy parameters.

Prescient search

DANA provides multiple types of searching, including traditional keyword, graph search, prevention, and prescient to deliver high-quality returns for future needs.

Alignment of interests

A subtle but important part of the KOS design aligns interests between individuals and organizations through flexible settings in the CKO Engine.



Discussion & Conclusion

We've entered a new era of automation accompanied by a variety of strategic obstacles, operational challenges, serious risks, and significant opportunities. Those organizations with strong multidisciplinary teams who have invested decades of R&D in AI clearly have an advantage.

However, even in the small minority of companies with deep experience, their focus is usually vertically oriented, such as Deere in farm automation, Google in search, ExxonMobil in energy, Caterpillar in autonomous trucks, or Nvidia in semiconductors.

Although most large companies budget for significant investment in enterprise technology, they tend to specialize in their industry. We're not aware of an EAI OS comparable to the KOS. The closest are niche, specialized verticals such as native web apps and SaaS firms.

That's not to say traditional companies are necessarily uncompetitive. For example, a few years ago Walmart was considered at risk from Amazon, but today the two companies are competitive, and some believe Walmart has the advantage. JPMorgan Chase & Co. is another market leader that is outperforming competitors, but with an IT budget of \$14 billion, it's also one of few that can compete with big tech in budgets.

Attempting to develop an EAI OS internally isn't a viable option for over 99% of organizations, hence the need for the KOS, which is automatically tailored to the needs of any organization (and individual with DANA) based on the perceived needs of the organization and the inputs from their people.

One of the common questions that comes up in our discussions with management teams is why do we need a single system? Many companies are understandably concerned about entrusting any vendor with something as important as their organizational OS. Our answer is quite simple—we allowed evidence to guide us. Our research convinced us that a unified, cohesive EAI OS enhanced with AI would become increasingly essential to remain competitive.

Any such system requires seamless interoperability, strong security, system-wide governance, and an engaging, easy-to-use interface, all of which strongly favors a single EAI OS. While other apps can and should be integrated, the EAI OS needs to be the primary and preferred system for learning and intelligence. The architectural design must be carefully crafted to ensure high quality and high performance.

With decades of R&D and experience designing, building, and operating multiple learning networks, we've developed considerable expertise and IP in the highly specialized field of knowledge systems. And since we've refined a highly efficient and affordable universal EAI OS in the KOS designed to protect customers, it seems wise to adopt the KOS.

To mitigate risks to customers and alleviate concerns, we offer several options, including a managed KOS hosted in hybrid cloud format, which can be run on most cloud providers, corporate data centers, or some combination. Customers can also license our KOS and manage the system internally, supported by consulting, which dramatically reduces risks in working with external vendors.

Our systems and culture are intentionally flexible to align with the needs of customers.

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