Hi, I'm Paul

As a technology leader and contributor with over 25 years of professional experience, my aim has always been to enable the success of others by creating tools and experiences which multiply efforts, expand horizons, and amplify voices.

I dedicate my experience as a technologist and creative scientist to further those goals in the evolving world of collaborative technologies: to transform how the world works, plays, and thinks together. To unlock the secrets of cooperative cognition, and use that understanding to connect people in new and powerful ways.

Let's talk about how we can join forces, align and fulfill our respective visions, and work together to improve the world.

Paul Tomlinson
paul@ptom.net
801-201-1070

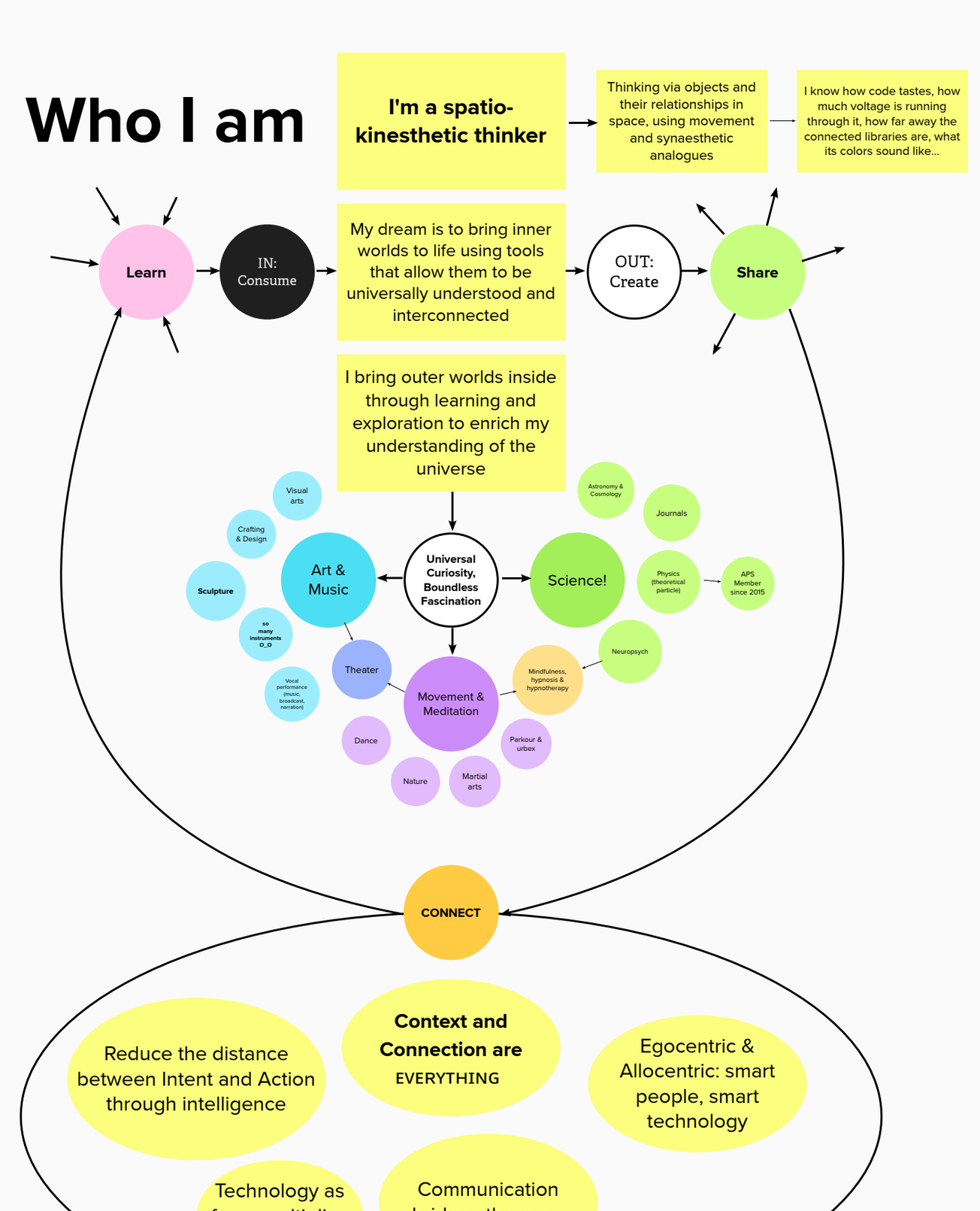
I am interested in roles in:

- **Creative technology innovation**
- **Engineering leadership**
- **VR, XR, AR, and beyond**
- **Hands-on invention and experimentation**

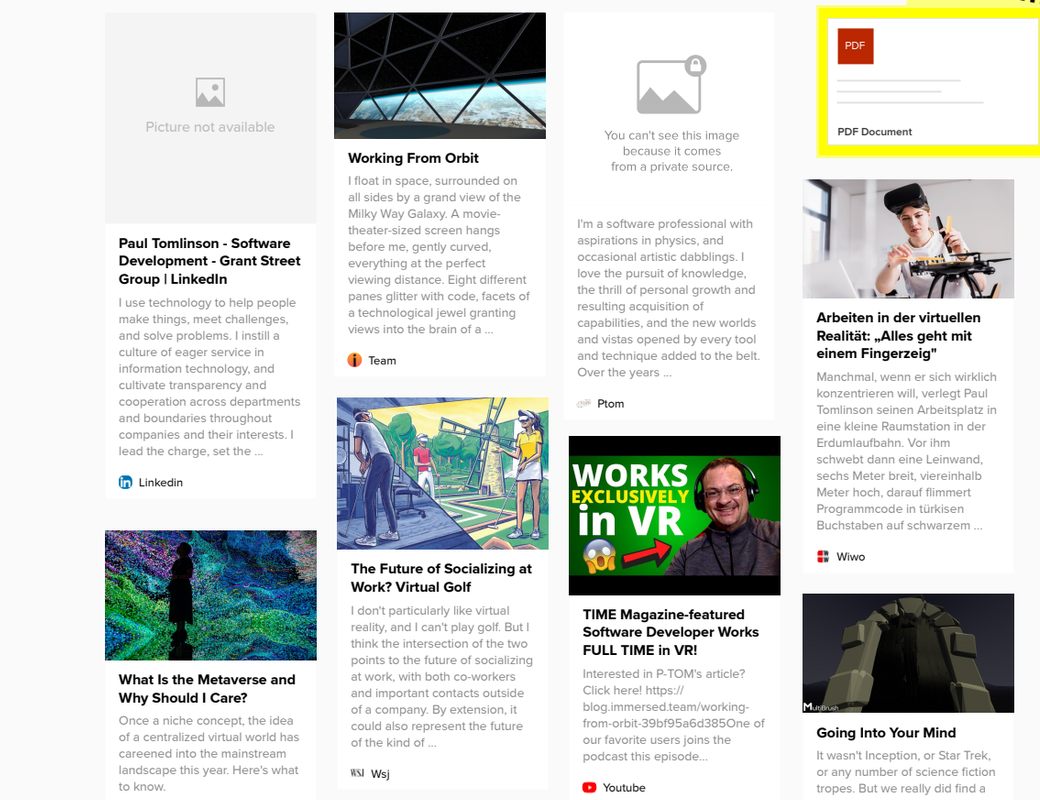
Values

Honesty	Clear, unequivocal, and direct (but kind) candor. Avoid self-delusion and rosy glasses.
Integrity	Right is always right. Share early and honestly. Own actions and consequences.
Humility	Promote the success of others. Move as a team. Lead with positive reinforcement. Triad.
Empathy	Honor the humanity of others. Seek understanding. Extend trust and faith.
Service	Lend a hand. Amplify each other's strengths. Be generous. Learn together. Share everything.
Determination	Stay hungry for the journey. Always take one more step. Find success on the other side.
Fun	Whimsy, self-deprecation, and delight. Don't take things (or self) too seriously. Look for the Wow.

Who I am


I'm a spatio-kinesthetic thinker
Thinking via objects and their relationships in space, using movement and synaesthetic analogues
I know how code tastes, how much voltage is running through it, how far away the connected libraries are, what its colors sound like...
Learn
IN: Consume
My dream is to bring inner worlds to life using tools that allow them to be universally understood and interconnected
OUT: Create
Share
I bring outer worlds inside through learning and exploration to enrich my understanding of the universe
Universal Curiosity, Boundless Fascination
Art & Music
Visual arts
Crafting & Design
Sculpture
Theater
Dance
Nature
Martial arts
Movement & Meditation
Mindfulness, hypnosis & hypnotherapy
Parkour & urbex
Science!
Astronomy & Cosmology
Journals
Physics (theoretical particle)
APS Member since 2015
Neuropsych
CONNECT
Reduce the distance between Intent and Action through intelligence
Context and Connection are EVERYTHING
Egocentric & Allocentric: smart people, smart technology
Technology as force multiplier, enabler
Communication bridges the gaps

Around the web


Traditional résumé
PDF
PDF Document

Paul Tomlinson - Software Development - Grant Street Group | LinkedIn
LinkedIn

Working From Orbit
I float in space, surrounded on all sides by a grand view of the Milky Way Galaxy. A movie-theater-sized screen hangs before me, gently curved, everything at the perfect viewing distance. Eight different panes glitter with code, facets of a technological jewel granting views into the brain of a ...
Team

Ptom

Arbeiten in der virtuellen Realität: „Alles geht mit einem Fingerzeig"
Wiwo

What is the Metaverse and Why Should I Care?
Time

The Future of Socializing at Work? Virtual Golf
Wsj

TIME Magazine-featured Software Developer Works FULL TIME in VR!
Youtube

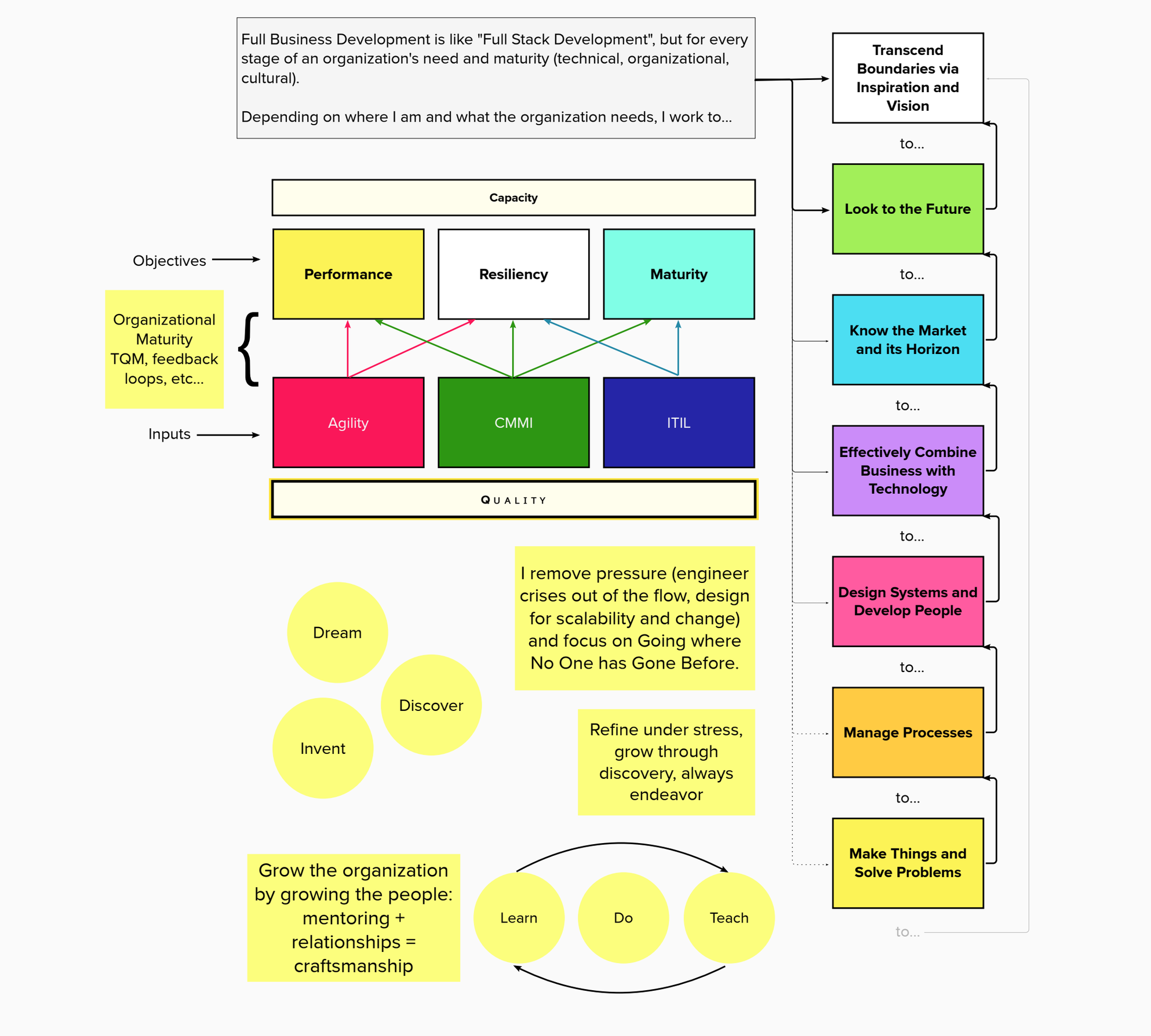
Going Into Your Mind
Medium

Skill stack

I use technology to help people solve problems and make things.

Full Business Development is like "Full Stack Development", but for every stage of an organization's need and maturity (technical, organizational, cultural).

Depending on where I am and what the organization needs, I work to...


Capacity
Objectives
Performance
Resiliency
Maturity
Organizational Maturity TQM, feedback loops, etc...
Inputs
Agility
CMMI
ITIL
QUALITY
Transcend Boundaries via Inspiration and Vision
to...
Look to the Future
to...
Know the Market and its Horizon
to...
Effectively Combine Business with Technology
to...
Design Systems and Develop People
to...
Manage Processes
to...
Make Things and Solve Problems
to...

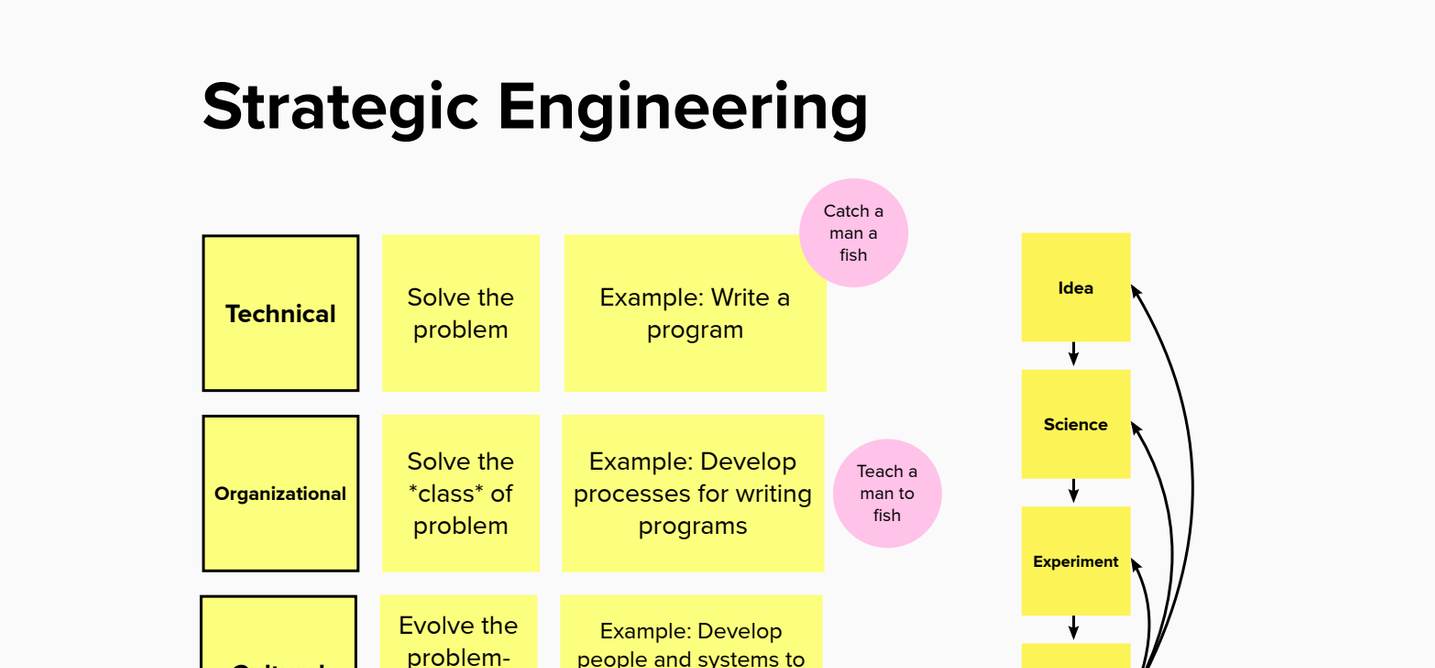
I remove pressure (engineer crises out of the flow, design for scalability and change) and focus on Going where No One has Gone Before.

Refine under stress, grow through discovery, always endeavor

Dream
Discover
Invent
Learn
Do
Teach

Grow the organization by growing the people: mentoring + relationships = craftsmanship

Strategic Engineering


Technical
Solve the problem
Example: Write a program
Catch a man a fish
Organizational
Solve the "class" of problem
Example: Develop processes for writing programs
Teach a man to fish
Cultural
Evolve the problem-solving apparatus
Example: Develop people and systems to shape the organization and processes
Build a fishery
Idea
Science
Experiment
Result

Areas of impact

I have experiencing working, managing, and strategizing across all sides of the technology landscape

All of the Above

Creating a long-term vision is simultaneously bold and humbling: bold to project ideas into the future and ask other people to invest their time, talents, energy, and livelihood to make them a reality. Humbling for the weight of responsibility, and the requisite willingness and wisdom to accept correction and adapt to circumstances and the insights of others.

Knowing how it all works isn't enough—great care must be exercised in finding the right people to own their respective areas, and investing in their success. Thus my focus within Executive Leadership is two-fold: clear vision and good people who can pull it off—with a lot of effort and energy put into both.

Exploring the Future

I am *always* looking for the "meta" - the *why* behind the work, and behind that, and so on: understanding how it all ticks, fits together, and what the bigger picture looks like. This includes healthy doses of practical experimentation to vet assumptions and find deeper connections as I try to explore the future.

data rules

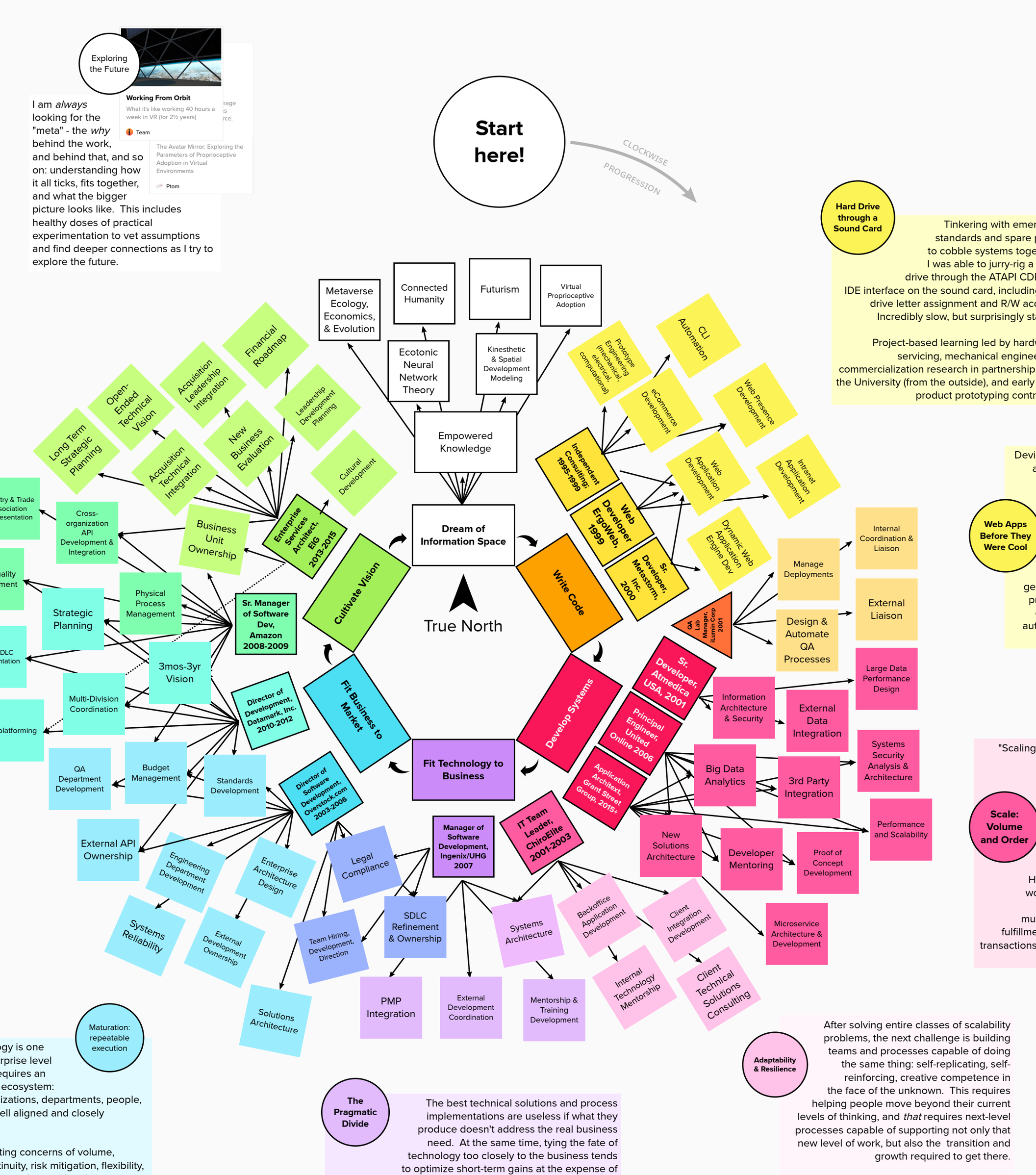
Real data-driven discipline has the power to transform every area of business and technology, but must be applied carefully and comprehensively to avoid blind spots and self deception.

Mathematical thinking and genuine scientific rigor can provide insights well beyond "business intelligence" tools, and must be combined with honesty and deep humility to understand, accept, and act on the lessons they provide. Measuring what matters means measuring a lot more than just the things you care about.

Replatforming

Businesses grow, markets change, technologies emerge (or submerge, as they're obsolesced). Eventually the technical foundations can no longer support current and future goals, and some manner of replacement is necessary—patches and repairs just won't be enough.

But the business has to stay online, and can't afford the opportunity cost of redeveloping in the shadows. Multiple occasions to lead this very effort: designing migratory architectures with minimal scaffolding and waste, corrective checkpoints for mid-flight adjustments, and adapting people as well as programs to move the entire organization in new directions. I've seen it done poorly, and learned to do it well.


Start here!
CLOCKWISE PROGRESSION
Working From Orbit
Metaverse Ecology, Economics, & Evolution
Connected Humanity
Futurism
Virtual Proprioceptive Adoption
Ecotonic Neural Network Theory
Kinesthetic & Spatial Development Modeling
Empowered Knowledge
Dream of Information Space
True North
Write Code
Develop Systems
Fit Technology to Business
Fit Business to Market
Cultivate Vision
Independent Consulting; 1995-1999
Web Developer, ErgoWeb, 1999
Sr. Developer, Metastorm, Inc. 2000
QA Lab Manager, iLumin Corp 2001
Sr. Developer, Atmedica USA, 2001
Principal Engineer, United Online 2006
Application Architect, Grant Street Group, 2015+
IT Team Leader, ChiroElite 2001-2003
Manager of Software Development, Ingenix/UHG 2007
Director of Software Development, Overstock.com 2003-2006
Director of Development, Datamark, Inc. 2010-2012
Sr. Manager of Software Dev, Amazon 2008-2009
Enterprise Services Architect, EIG 2013-2015
CLI Automation
Prototype Engineering (mechanical, electrical, computational)
eCommerce Development
Web Presence Development
Web Application Development
Intranet Application Development
Dynamic Web Application Engine Dev
Manage Deployments
Internal Coordination & Liaison
External Liaison
Design & Automate QA Processes
Large Data Performance Design
Information Architecture & Security
External Data Integration
Systems Security Analysis & Architecture
Big Data Analytics
3rd Party Integration
Performance and Scalability
New Solutions Architecture
Developer Mentoring
Proof of Concept Development
Microservice Architecture & Development
Backoffice Application Development
Client Integration Development
Internal Technology Mentorship
Client Technical Solutions Consulting
Systems Architecture
Mentorship & Training Development
External Development Coordination
PMP Integration
SDLC Refinement & Ownership
Team Hiring, Development, Direction
Legal Compliance
Solutions Architecture
External Development Ownership
Enterprise Architecture Design
Engineering Department Development
Systems Reliability
External API Ownership
Standards Development
Budget Management
QA Department Development
Replatforming
Multi-Division Coordination
3mos-3yr Vision
Agile SDLC Implementation
Strategic Planning
Physical Process Management
Total Quality Management
Cross-organization API Development & Integration
Industry & Trade Association Representation
Business Unit Ownership
Acquisition Technical Integration
New Business Evaluation
Long Term Strategic Planning
Open-Ended Technical Vision
Acquisition Leadership Integration
Financial Roadmap
Leadership Development Planning
Cultural Development

Hard Drive through a Sound Card

Tinkering with emerging standards and spare parts to cobble systems together, I was able to jurry-rig a hard drive through the ATAPI CDROM IDE interface on the sound card, including full drive letter assignment and R/W access. Incredibly slow, but surprisingly stable.

Project-based learning led by hardware servicing, mechanical engineering commercialization research in partnership with the University (from the outside), and early web product prototyping contracts.

Web Apps Before They Were Cool

Devised tools and techniques for rich web applications pre-AJAX, but with similar features, cross-browser compatibility (back when that was a big deal), and even standalone CD-distributable apps. Innovations ahead of their time, now entirely obsolete.

Used this library of features to create systems which dynamically generated interfaces based on business process diagrams, overhauled intranet-deployed scientific analysis tools, and automated third-party integration testing and reporting.

Scale: Volume and Order

"Scaling up" is a combinatorial problem space, about so much more than data volumes and processing power. Complexity and risk are multiplied, and require entirely new thinking, technologies, architectures, and skill sets.

Nearly all my systems-level development has been about solving hard problems at scale: self-assembling parallel processing clusters (map-reduction algorithms in a pre-Hadoop world), schemas capable of mapping the world's library of pharmaceuticals all the way from molecular structure to outer packaging text by municipality, millions of customer orders in need of fulfillment and tracking, and tens of billions of dollars in transactions managed in and out of aggregate transmission and distributions.

Adaptability & Resilience

After solving entire classes of scalability problems, the next challenge is building teams and processes capable of doing the same thing: self-replicating, self-reinforcing, creative competence in the face of the unknown. This requires helping people move beyond their current levels of thinking, and *that* requires next-level processes capable of supporting not only that new level of work, but also the transition and growth required to get there.

This includes tailored SDLC and Agile implementations, PMO integration, executive representation and planning pipelines, among other things.

The Pragmatic Divide

The best technical solutions and process implementations are useless if what they produce doesn't address the real business need. At the same time, tying the fate of technology too closely to the business tends to optimize short-term gains at the expense of long term stability and growth, while exacerbating technical debt. Being able to speak equally to the concerns of both Business and Technology makes it possible to pragmatically bridge the divide, establish common ground, find patience, and compromise effectively.

This marks my transition from principal technologist and keen manager into senior leadership as a functional diplomat: connecting people and ideas, then seeing them through to completion instead of simply following orders.

Maturation: repeatable execution

Scalable technology is one thing, but an Enterprise level of performance requires an entire supporting ecosystem: all the right organizations, departments, people, and processes, well aligned and closely coordinated.

Balancing competing concerns of volume, repeatability, continuity, risk mitigation, flexibility, opportunity cost, etc., along with industry exposure, thought leadership, and enabling the success of partners, affiliates, and ancillary markets. Diplomacy gets an Executive upgrade and includes an outward focus as well.

Work history

Progressive experience as jr-, sr-, and director-level contributor and leader

Whereas the "**Areas of Impact**" section is organized by a progression of skills, responsibilities, and complexity, the literal timeline is somewhat murkier—but then, most journeys are rarely a straight line.

My entire career has been guided by simple philosophies extending from my values: help people, typically by building things with technology in order to solve problems or enable new possibilities.

Early in my career that meant doing research and writing code: understand the problem and encapsulate its logic in computational lingua franca, creating a wide variety of programs and systems fit to a given organization. I learned to write in well over a dozen programming languages, an even larger number of frameworks and patterns, and the idiosyncrasies of every major data storage engine on the market.

As the complexity of the problem space and my skills expanded, I reached a point where the technology was not the limiting factor: people and processes exerted a greater influence on successful outcomes. I assumed managerial roles to ensure the technology could still meet its objectives—focusing on processes, communication, and enabling the success of other technologists.

This pattern played out repeatedly as my sphere of influence expanded in order to better ensure the success of preceding concerns: from managing people and processes, to teams, departments, business units, and entire organizations. Regardless of the type of business or its market, there was always an emphasis on strong technical acumen and architectural leadership in my roles: never losing touch with the theory and practice of software.

Occasionally, in order to better serve my family, take care of myself, or reduce occupational pressures, I've stepped down from more senior positions back into hands-on responsibilities. It gives me a good opportunity to sharpen the axe and bring a high caliber of performance into my contributions, and provides lots of chances for mentoring and teaching.

Most recently that meant moving from an Enterprise Services Architect at EIG to a Lead Developer at Grant Street Group—full time remote, familiar technologies, and a high emphasis on work-life balance. It has also been a master class in the development and administration of a healthy, high performance culture: a values-led approach to leadership and honoring the humanity of others, resulting in the only genuine Stage 4-5 environment in which I've ever worked (with regard to Tribal Leadership social organization designations).

After six years working as a developer, mentor, and lead at GSG, my break time is over: I'm interested in resuming the Senior Leadership track, finding ways to apply the things I've learned here, and use more of the creative sides of my talents.

Independent Consulting; 1995-1999
- Learning on-the-job, everything from market research to mechanical engineering integration. Pushed the envelope of web technologies as they grew up, pioneering early visions of AJAX, web apps, e-commerce, and remote learning.

Web Developer ErgoWeb, 1999
- Scientific analysis tools for intranet and extranet web applications, productizing a university research project into a viable business. Emphasis on usability and cross-browser compatibility, which was a big issue at the time.

Sr. Developer, Metastorm, Inc. 2000
- Created a dynamic web application engine, capable of producing new application interfaces from business process definitions: teaching the system how to build what I'd been building.

QA Lab Manager, iLumin Corp 2001
- Managed the QA lifecycle for the flagship digital document signing application, the machine lab on which those tests were conducted, and coordinated with external partners and clients on integration testing and verification.

The Dot Com Era
It looked like a bubble. I avoided everything about the "dot-com" culture and misguided e-commerce land grab, but it affected the entire tech sector, destabilizing the labor market. Places went under even as I kept getting hired.

Sr. Developer, Atmedica USA, 2001
- Worked with the most gorgeous schema I'd ever seen to integrate pharmacology data from across the globe into a seamless, elegant database. Made tools for exporting custom slices in a proprietary, secure data engine for clients.

IT Team Leader, ChiroElite 2001-2003
- Modernized home-grown prototypes into scalable web applications, created complete back-office and support tools, and integrated everything with the physical production facilities.

Director of Software Development, Overstock.com 2003-2006
- Inherited a broken system and skeleton crew, and quickly worked my way to the top by finding ways to mitigate risk, increase throughput and quality, and proactively reach out to our internal customers instead of firefighting: from Start-up to Enterprise.

Principal Engineer, United Online 2006
- Built scalable, self-organizing clusters for internal analytics and business intelligence. Invented bespoke map-reduction technology with an easy plug-in architecture for adding new insights, and processed years of backlogged data.

Manager of Software Development, Ingenix/UHG 2007
- Led the maturity and integration of an acquired start-up product into the established organization, including technology, people, processes, and regulatory compliance. Grew people into stronger technologists, and proof-of-concept prototypes into viable offerings.

Sr. Manager of Software Dev, Amazon 2008-2009
- Owned the business of the inbound product supply chain at the confluence of: transportation logistics, labor management, purchasing and accounting, and fulfillment. Developed people, processes, hardware, and programs, and answered for performance, quality, budget, and cooperation with the larger org.

Director of Development, Datamark, Inc. 2010-2012
- Grew the performance of a small team through cultural transformation. Established a virtuous cycle of quality-minded improvements that compounded productivity over time, and enabled major application improvements and new products.

Enterprise Services Architect, EIG 2013-2015
- Integrated acquired businesses with the enterprise architecture and technology stack, built new products to monetize that technology, and coached business units to mature leadership, personnel, processes, and architectures.

Application Architect, Grant Street Group, 2015+
- Hands-on technical lead, combining the trail-blazing of new tools, technologies, and architectures, with the scalability, stabilization, and performance improvements of existing products. Inventing new products and technologies to close gaps and enable new business, and cultivating strong relationships and cultural foundations as a catalyst for the success of others.

Creative Scientist, Strategic Engineering...?

Work future

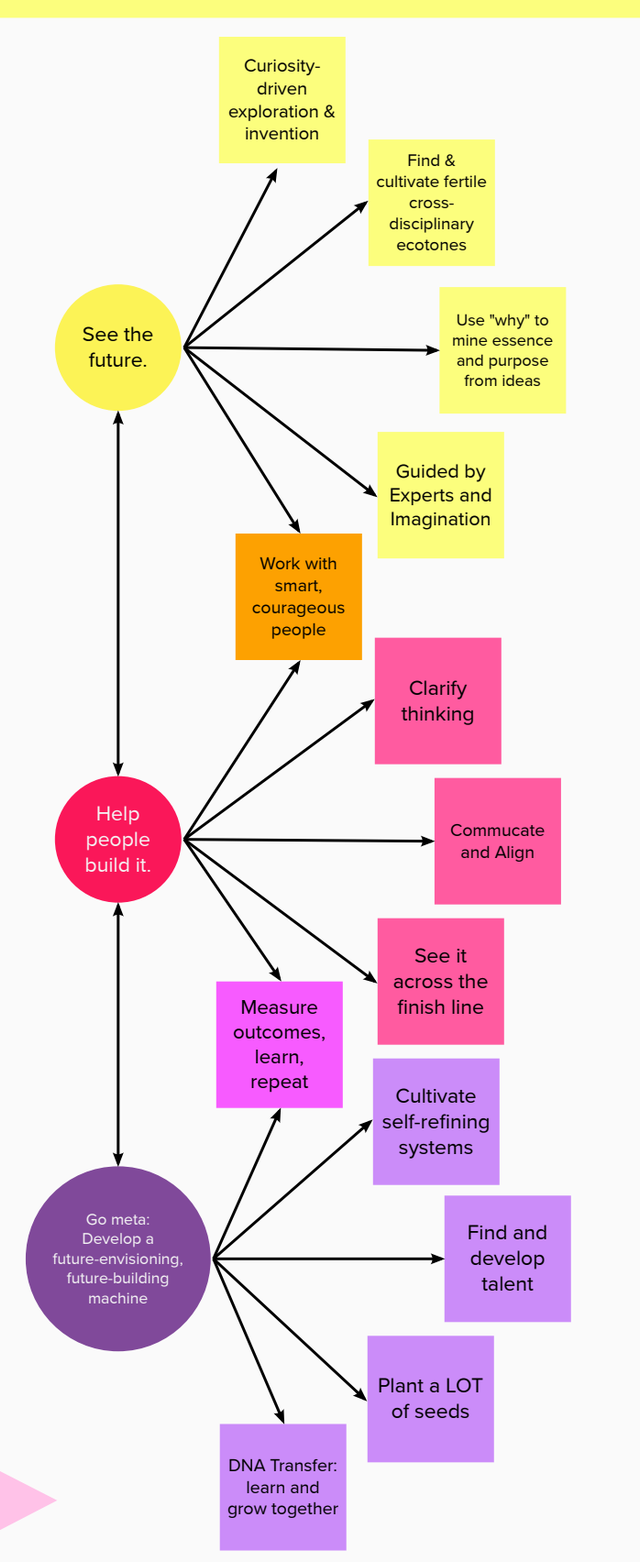
Your next hire

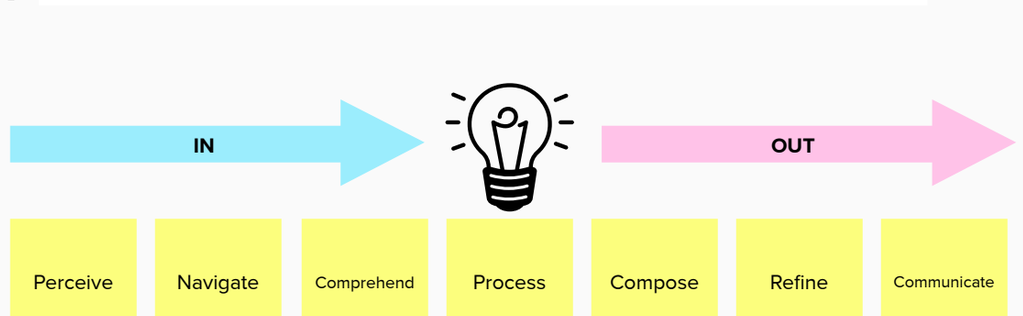
What's Next?

A "creative scientist"

As a creative scientist you will see new futures, and work with others to bring them into focus. You will: help distill objectives, strategies, systems, and plans out of collaborative imagination; articulate complex concepts to broad audiences; connect the visionary and the practical. Your legacy will be the establishment of a perpetually renewed, self-refining source of innovation that, as a discipline, defies regression toward the mean.

- Imagine possible futures of collaborative cognition: seamlessly and effortlessly thinking together, and translating thought into action.
- Help invent, identify, and articulate new ideas and the opportunities they enable.
- Use good science and engineering principles to:
  - Distill imagination into strategy and systems design: how will it work, and what will it take?
  - Ground design thinking around customer experience, concerns, capabilities, and goals.
  - Produce and maintain supporting artifacts: strategic design and implementation maps, objective and plan breakdowns, and guiding principles.
  - Liaise between visionaries and stakeholders to convert plans into action: products, processes, and operations.
  - Measure outcomes against short and long term vision: continuously develop the feedback loop.
- Design and create systems and processes to support all of the above as their own discipline and competency.


See the future.
Curiosity-driven exploration & invention
Find & cultivate fertile cross-disciplinary ecotones
Use "why" to mine essence and purpose from ideas
Guided by Experts and Imagination
Work with smart, courageous people
Help people build it.
Clarify thinking
Commucate and Align
See it across the finish line
Measure outcomes, learn, repeat
Go meta: Develop a future-envisioning, future-building machine
Cultivate self-refining systems
Find and develop talent
Plant a LOT of seeds
DNA Transfer: learn and grow together


IN
OUT
Perceive
Navigate
Comprehend
Process
Compose
Refine
Communicate

Case Studies

3 in-depth examples from my work history that explore distinct types of problems and how I approached each

Organizational Case Study: DataMark

Replatforming

Technical and organizational growing pains limited performance and flexibility.

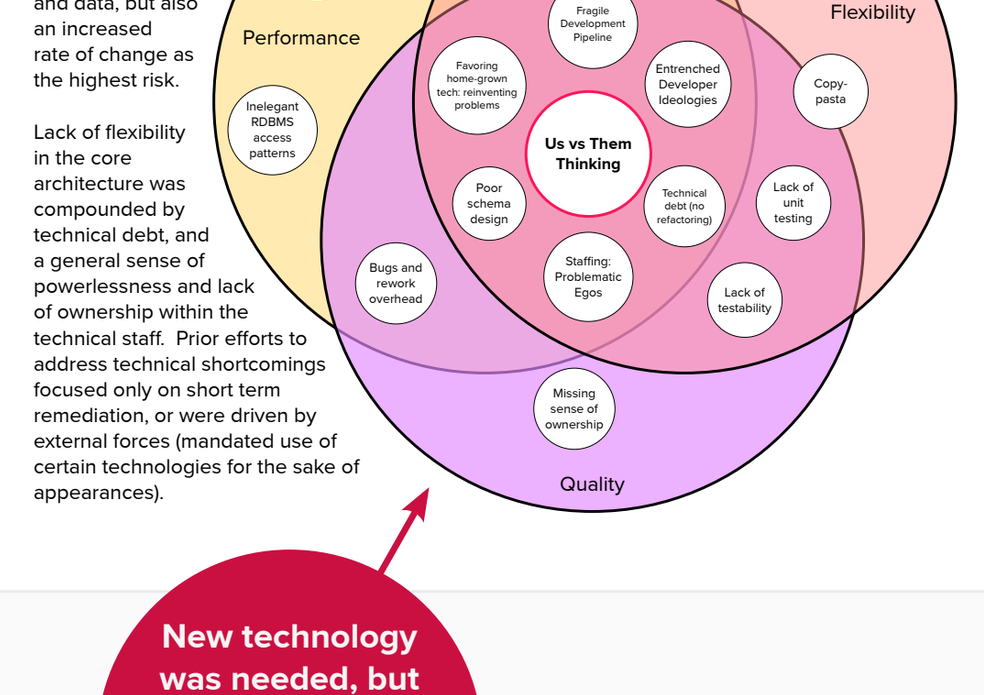
Compound cultural gains created space for innovation in a virtuous cycle

1 **Problem: Primary application scalability**

DataMark's SaaS "lead management" platform was struggling to keep up with increasing load and evolving needs of customers. Consistent issues with scalability, complexity, quality, and flexibility.

Root cause analysis uncovered technical and cultural factors hampering performance and adaptability. More customers meant not only more load and data, but also an increased rate of change as the highest risk.

Lack of flexibility in the core architecture was compounded by technical debt, and a general sense of powerlessness and lack of ownership within the technical staff. Prior efforts to address technical shortcomings focused only on short term remediation, or were driven by external forces (mandated use of certain technologies for the sake of appearances).


Performance
Flexibility
Quality
Increased user load
Increased data volume
Repurposed Application Framework (ill-fitted)
No standardization
Fragile Development Pipeline
Favoring home-grown tech: reinventing problems
Entrenched Developer Ideologies
Copy-pasta
Inelegant RDBMS access patterns
Us vs Them Thinking
Poor schema design
Technical debt (no refactoring)
Lack of unit testing
Bugs and rework overhead
Staffing: Problematic Egos
Lack of testability
Missing sense of ownership

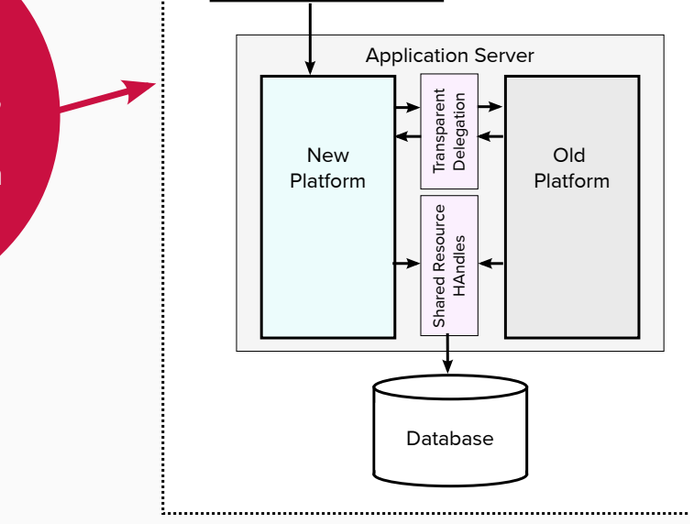
New technology was needed, but the existing culture and skill set couldn't get there

2 **Strategy: Architecting for Innovation**

Make the programs, people, and processes more flexible by improving from the foundation up: use industry best practices (where applicable), instill a growth mind set, and design for change.

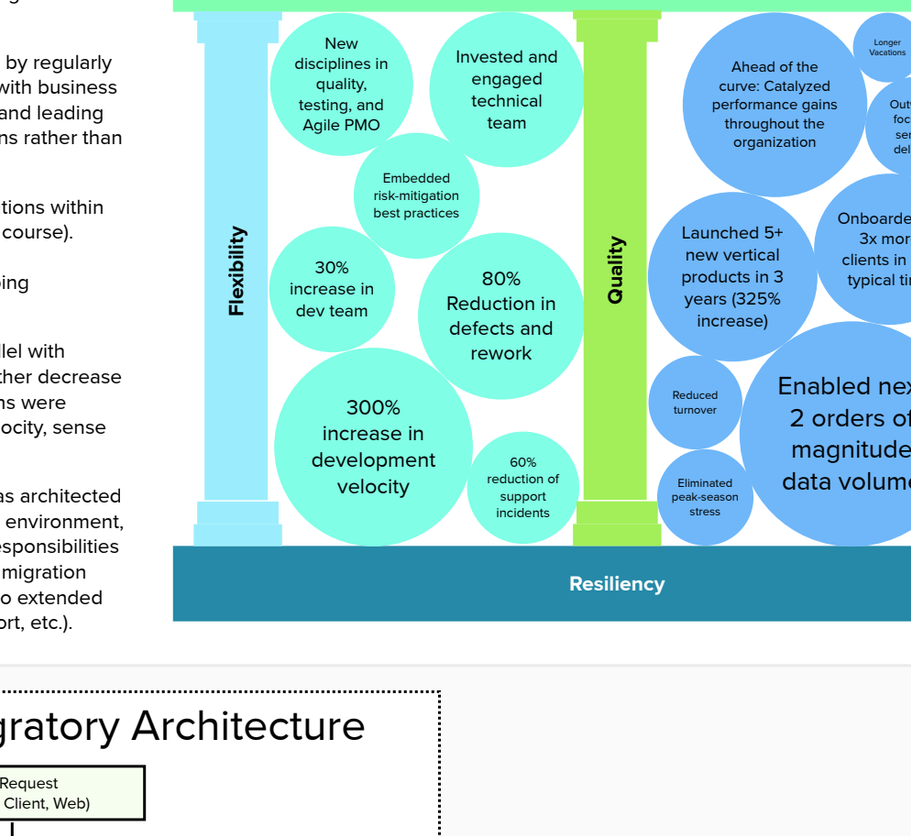
Aim Higher: Go Meta	Clarified goals and expectations: make adaptability and flexibility a core feature of our systems and services, not just solving the current crop of challenges and customer demands. *Expect* change, build technology in an open-ended way, and always look for underlying reasons and driving forces to ensure the right problems are being solved.
Cultural Shift	Change **Us** and **Them** into **WE**. Level the development organization by regularly rotating responsibilities and sharing the load, improve relationships with business operations by changing "what do you need?" into "how can I help?", and leading the technical discovery and new solutions development conversations rather than waiting and reacting. Introduced **Tribal Leadership** company-wide.
Realistic Goals (and Budgets)	Found ways for existing staff to improve and adapt, and look for solutions within reach of their skill set and experience (while still fostering growth, of course). Gave developers an active role and voice in identifying architectural improvements, future platform selection, and process changes, shaping conversations and outcomes while avoiding edicts.
Build on wins	Stabilizing churn provided "air cover" to make improvements in parallel with regular operations. Each initiative was designed and selected to further decrease churn, increasing labor allocation flexibility and total throughput. Wins were publicly celebrated, and the snowball effect resulted in improved velocity, sense of ownership, and morale.
Incremental Migration	After new platforms and tools were selected, a migration strategy was architected to allow old and new systems to operate simultaneously in the same environment, and even on the same hardware. Functional units and application responsibilities were shifted from Old to New a piece at a time, allowing a seamless migration experience for our customers and immediate value from the effort (no extended parallel development, no massive cutover, immediate fall-back support, etc.).

Coaching toward the right technical solution took time, but created a proper fit the team could maintain


Migratory Architecture
Request (API, Client, Web)
Application Server
New Platform
Transparent Delegation
Shared Resource HAndles
Old Platform
Database

3 **Outcome: Higher capacity, velocity, and resiliency**

Resilient culture produced a resilient and performant product, using technology appropriate for the skills, environment, and budget. Reduced overhead through higher quality accelerated all phases of development and support.


Growth
Flexibility
Quality
Performance
Resiliency
New disciplines in quality, testing, and Agile PMO
Invested and engaged technical team
Embedded risk-mitigation best practices
30% increase in dev team
80% Reduction in defects and rework
300% increase in development velocity
60% reduction of support incidents
Ahead of the curve: Catalyzed performance gains throughout the organization
Longer Vacations
Outward-focused service delivery
Launched 5+ new vertical products in 3 years (325% increase)
Onboarded 2-3x more clients in < ½ typical time
Reduced turnover
Eliminated peak-season stress
Enabled next 2 orders of magnitude data volume

Out of the Crisis: Massive improvements in quality, capacity, productivity, morale, and performance

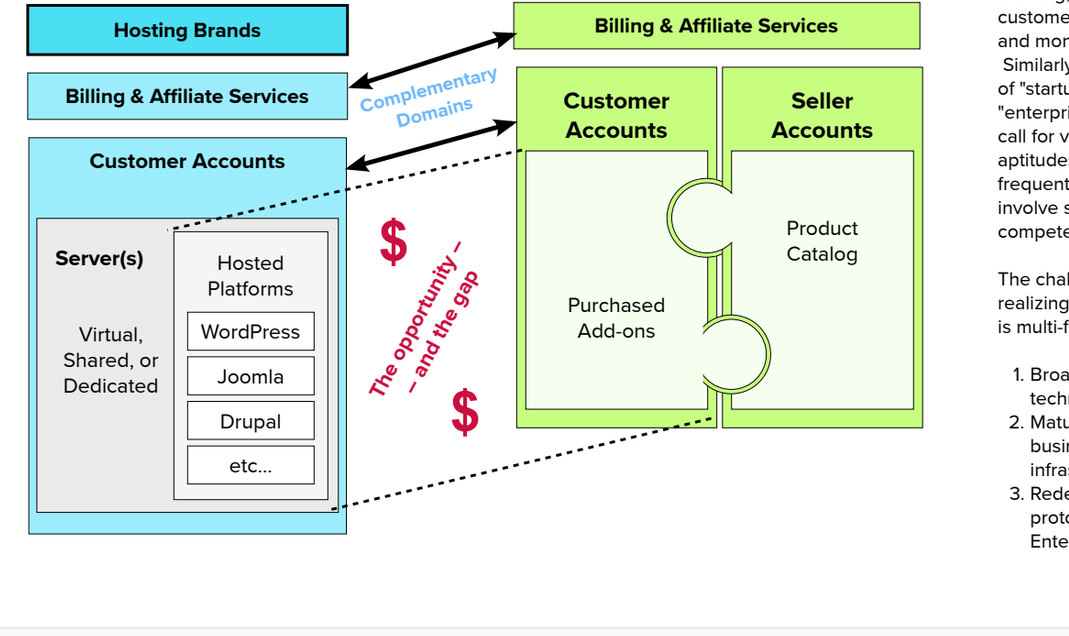
Cultural Case Study: EIG's MOJO Marketplace

Acquisition & Integration

EIG could supply a firehose of customers to MOJOs, but they weren't equipped to handle it.

1 **Challenge: integrate MOJO Marketplace into EIG properties**

EIG is a hosting provider. MOJO Marketplace is a reseller venue for hosted platform add-ons. In theory it's a good match between EIG accounts and potential MOJO customers, but integrating them poses unique challenges.


EIG
MOJO Marketplace
Hosting Brands
Billing & Affiliate Services
Customer Accounts
Server(s)
Virtual, Shared, or Dedicated
Hosted Platforms
WordPress
Joomla
Drupal
etc...
Complementary Domains
The opportunity – and the gap
$
Billing & Affiliate Services
Customer Accounts
Seller Accounts
Purchased Add-ons
Product Catalog

MOJO needed more mature technology and business processes, and EIG needed flexibilty

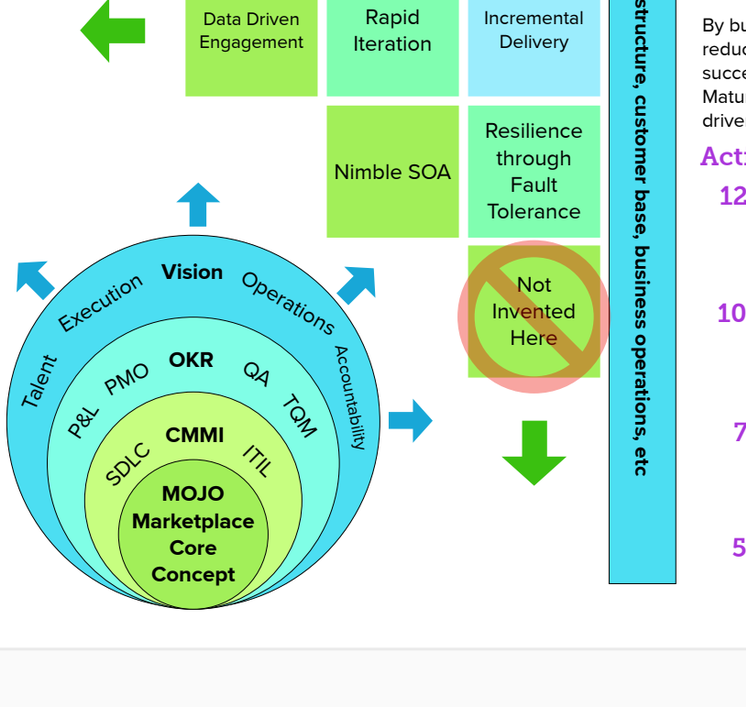
2 **Mind the Gap: Scalability is about more than scale**

Existing talent on both sides work in very different ways, and the acquired infrastructure won't be able to handle the increased volume. The tools at everyone's disposal cannot build a bridge from A to B - new approaches are required.

The domains are complementary, but not symmetrical - they involve completely different frameworks of thinking, approaches to customer experience, and monetization. Similarly, the domains of "startup" and "enterprise" call for very different aptitudes, and are frequently in conflict or involve significant competency gaps.

The challenge then in realizing the opportunity is multi-faceted:

1. Broaden EIG's technical mindset
2. Mature MOJO's business infrastructure
3. Redevelop prototypes at Enterprise scale

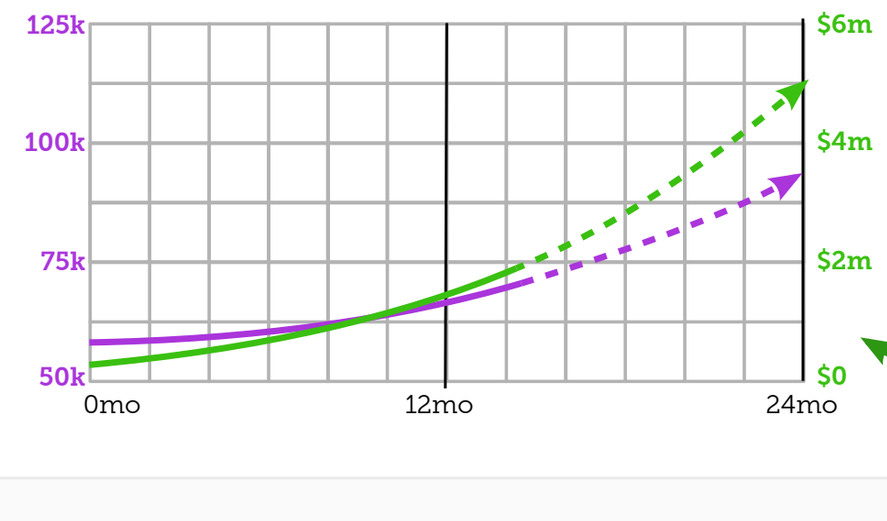

EIG Core technical competencies, financial resources, physical infrastructure, customer base, business operations, etc
Data Driven Engagement
Rapid Iteration
Incremental Delivery
Nimble SOA
Resilience through Fault Tolerance
Not Invented Here
Vision
Execution
Operations
Talent
Accountability
OKR
PMO
QA
P&L
TQM
SDLC
CMMI
ITIL
MOJO Marketplace Core Concept

3 **Open-Ended Growth Mindset**

Focus on improvement over time—with an adaptive growth mindset—closed the gap between very different ways of doing business and created a profitable new venture. Lean Startup principles shortened delivery time and put emphasis on the customer experience.

Change within EIG was historically expensive, due to the number of moving parts and the emphasis on bullet-proofing at all stages. It's a sound strategy for a hosting company where "uptime" is the primary measure of success, but for a new venture under development, that kind of future-proofing would require knowing exactly how customers would be using and responding to the system in advance.

By building and adapting over time instead, the product was able to grow its market by degrees, reducing the risk of building the wrong product (or the right product in the wrong way). "Eventual success" became the way of doing business and helped a small team achieve large milestones. Maturing business acumen grounded those achievements in measurable values for creating truly data-driven strategies.



Building both sides toward the middle shortened delivery and resulted in a better product

MOJO achieved scalability through guided reinvention: new ways of realizing the same vision

Technological Case Study: Grant Street Group

Hardware Integration

GSG didn't break it, but DID have to fix it, and had a LOT of sunk costs.

It's never JUST the technology; no application is an island.

1 **Looming End-of-Life for business-critical browser plug-in support**

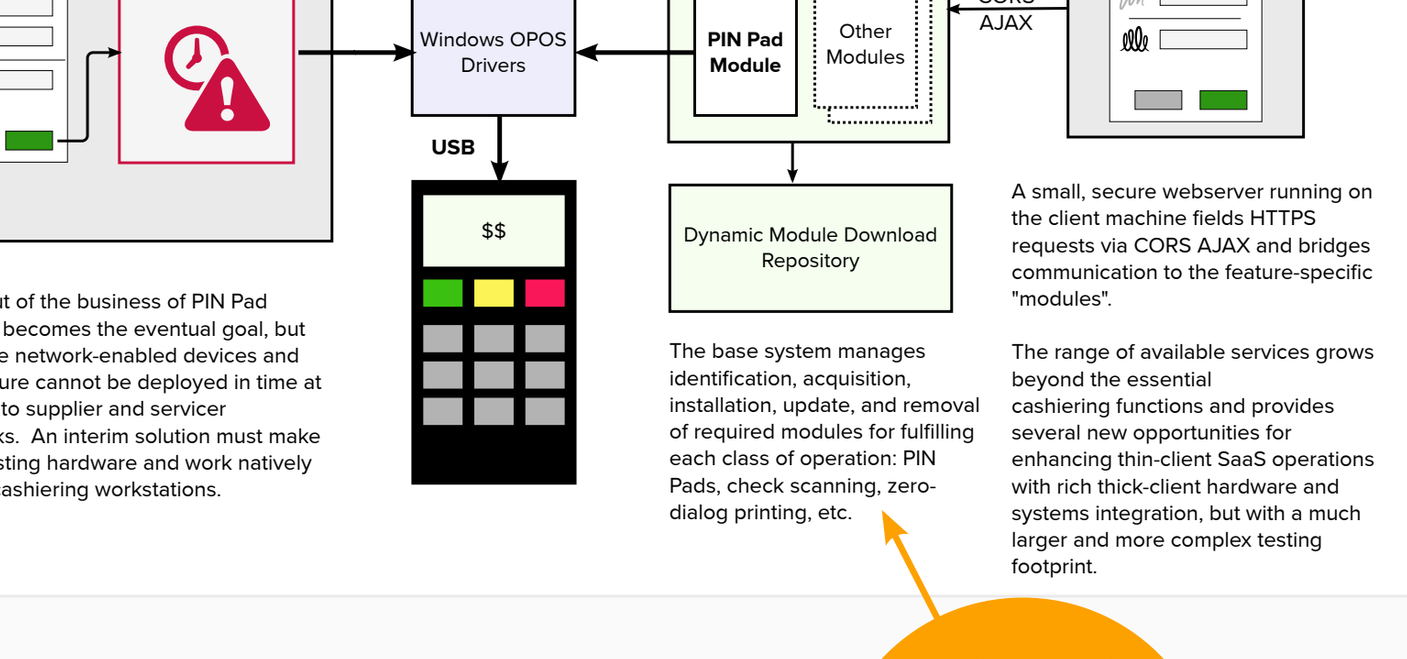
GSG provides Web-based SaaS cashiering to its customers, requiring communication between the browser and PIN Pad devices attached via USB. Web plugins enabled this communication, but the plugin protocol is being deprecated.

The cashiering modules of the SaaS products use a JAVA applet running in the browser to communicate with the drivers and USB devices on the same machine, handling handshaking, configuration, and complex business logic and state management.

The applet approach is brittle, but functional, and allows for dynamic updates by deploying new versions of the applet to the web server.

But browser plugin protocols are being deprecated due to security and privacy concerns, irrevocably breaking this crucial technology. Maintaining business operations will require some solution before the deadline.

Getting out of the business of PIN Pad interfaces becomes the eventual goal, but standalone network-enabled devices and infrastructure cannot be deployed in time at scale due to supplier and servicer bottlenecks. An interim solution must make use of existing hardware and work natively on client cashiering workstations.


The Browser
JAVA Applet
OLD
NEW
Windows OPOS Drivers
USB
$$
Local HTTPS Mini-Server https://gwa.gsglocal.com = https://127.0.0.1
PIN Pad Module
Other Modules
CORS AJAX
The Browser
Dynamic Module Download Repository

The best solution was too far away: not enough vendor production capacity

2 **Necessity drives invention, reality provides the speedbumps**

Deployed software has a totally different lifecycle than SaaS, and the Windows operating system and hardware ecosystem is much more complex than browsers. Several new technologies and strategies are required.

The base system manages identification, acquisition, installation, update, and removal of required modules for fulfilling each class of operation: PIN Pads, check scanning, zero-dialog printing, etc.

A small, secure webserver running on the client machine fields HTTPS requests via CORS AJAX and bridges communication to the feature-specific "modules".

The range of available services grows beyond the essential cashiering functions and provides several new opportunities for enhancing thin-client SaaS operations with rich thick-client hardware and systems integration, but with a much larger and more complex testing footprint.

Technical solution was a fractal of rabbit holes: new microservices, architectures, and support systems required

3 **"Involuntary" upgrades are still opportunities for improvement**

No easy wins: totally new skill sets, overhauled infrastructure, large, live migration strategy—all to fix an "invisible" technology broken by external factors. But it's more than a functional necessity: it's an important touch point with our clients and an opportunity to serve and delight.

The technology proved sound and managed to get done on time, but the costs were high: GSG is not a Windows shop, and did not have the right skills or experience to build it. They were used to a very different software paradigm with faster iteration and deployment around a centralized application, A/B testing capabilities, and segmented roll-out/roll-back; installed desktop apps were totally foreign territory.

Success was on the far side of multiple failures and hard-won lessons. Use of contractors to help with prototyping was an effective *technical* decision, but did not develop the necessary tools, processes, and infrastructure to support ongoing development. Deferring scalability and future-proofing is an appropriate early stage strategy, but leaving your unknowns unknown is not.

Instead of finding people who could simply execute the given direction, GSG eventually found those who specialized in delivering the entire pipeline and **listened** to them. This resulted in new architectures, delivery strategies, testing and feedback gathering tools, and several competencies for working with the Windows platform and ecosystem nobody had even known were missing.

The final product turned into a product *line*, a complete suite of capabilities for GSG's clients and their workforces, enabled by a stronger foundation than was envisioned as part of the initial problem to be solved. Adding experience and **professionalism in the right areas** turned a fraught necessity into a growth opportunity, a chance to delight clients by more completely owning the challenge and looking ahead—not just maintaining present conditions (and limitations).

Asking, "what does it take to make this?" instead of "please make this" made all the difference.