Coller Venture Review 2023

Coller School of Management
Tel Aviv University

Bridging Theory and Practice in Venture

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Letter from the Editor

We are pleased again this year to bring the *Coller Venture Review* to our global audience, with renewed appreciation to our contributors and stakeholders around the world.

While "innovation" can be a powerful concept, it has become so potentially over-used that one could say it has become nearly meaningless. In this issue then, we have tried to wrest the work to the ground to give it renewed strength and meaning, with examples taken across industries and functional areas. We start off with an interview with Mattel's CEO Ynon Kreiz: As Kreiz suggests, innovation refers to the transformation of a one-time toy company into an entertainment leader and that part of the metaverse dubbed "Metavertainment." This transformation takes IP, distribution, and of course planning based in industry and competitive context. However, as Professors Andriole and Barsky point out in their article "Innovation's Quiet Truth," such innovation also requires courageous leadership. "Innovation is not a mainstream function," they remind us. "Regardless of the industry, at its essence, [innovation] challenges orthodoxy, vested interests, misaligned incentives and entrenched workplace power bases."

From a different and equally powerful perspective on innovation, author, columnist and Visiting Fellow at Chapman's University's Smith Institute Virginia Postrel takes us on a deep dive into the world of synthetic biology. The food we eat has historically been enmeshed with our biology, our sociology, and our culture – it has helped define us. Yet, as Virginia describes the change taking place among producers, buyers, and market-makers, "Given a few decades synthetic biology enthusiasts imagine, substances grown with biology will be as much a part of our everyday lives as petroleum-derived products are now." Bringing the point home is Wildtype co-founder Arye Elfenbein, who notes "[Ours] is the cleanest salmon you will ever have in your life. It contains nothing but fish: no parasites, no mercury, no microplastics. Wildtype knows everything about the salmon because it grew the tissue in a vat."

Innovation also comes of course from more traditional software and hardware, as we are reminded by Fort Robotics Founder Samuel Reeves, whose autonomous control company serves many of the Fortune 100 (Amazon, Robotics, John Deere, Boeing, Ford, Toyota) from its original inception as a demining company. And lest we think the IoT world is limited to new ventures, Abhay Kinra from Denmark's Maersk summarizes how technology is being implemented in shipping, one of the world's oldest industries. As Abhay summaries, "It will create industry-wide standards for data and interfaces, interoperability of smart container solutions, digital improvements in operations to reduce wastage of resources, reduced greenhouse emissions, and documentation related to cybersecurity."

Across the range and looking forward, we trust our readers and supporters will be encouraged to think increasingly about all the many expressions of innovation- what it takes to see the opportunity, execute against it, and then achieve impact. As always, we thank our Advisory Board for contributing academic articles that give context to the changes we see, steward, and experience around us.

Special thanks this year to Dr. Leslie Broudo, our Managing Editor. We welcome any comments and suggestions from our readers that will help us improve the value of *Coller Venture Review* to its readership. We also invite our colleagues to download and distribute articles from our website, https://collerventurereview.tau.ac.il.

We trust this Review and the next steps it represents continue to help guide a bright future ahead.

Sincerely,

Moshe Zviran
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Venture Policy and Management

Industry Transformation, from the Metaverse to Synthetic Biology

Overview

Our *Venture Policy and Management* section frames questions at the intersection of new venture creation and policy globally. In this issue, we address the challenges and opportunities of transformative leadership.

In an interview with Mattel's CEO Ynon Kreiz, we gain a peek into how a once traditional toy company is becoming a leader in the entertainment industry, and the part of the metaverse that has been dubbed "Metavertainment."

From a different but overlapping vantage point also focused on transformation, Virginia Postrel, a visiting fellow at the Smith Institute for Political Economy and Philosophy at Chapman University in California, helps us consider synthetic biology, and how natural alternatives may one day seem aesthetically and morally repugnant.

Together, these articles combine theory and practice to help us consider change, and how it can be directed, amplified, and eventually lead to something totally different.

Looking forward, future discussions in the *Venture Policy and Management* section will continue to address expressions of management that are bending seemingly certain trajectories and leading to new expressions of new venture creation globally.

How Does a "Toy Company" Become a Leader in the Metaverse?

Ynon Kreiz
Chairman and CEO, Mattel, Inc.

Ed Frank
CEO, Axis Innovation

In this interview developed in partnership with CEO Ed Frank of Axis Innovation, Mattel Chairman & CEO Ynon Kreiz discusses how toys are an important part of the digital economy. In fact, while Mattel may be best known for its toy products such as Barbie dolls and Hot Wheels, Kreiz has a different, innovative vision, one centered on the IP space. Under his leadership, Mattel has begun production on Barbie movies, TV shows, and NFTs. Between 2018–21, adjusted operating income improved by more than $960 million, and Mattel achieved its highest annual growth in decades. But how did Kreiz and his team create this growth – what role did efficient operations and management of the supply chain play in achieving greater success? And more broadly, – how does traditional "play" interact with technology? Kreiz discussed these questions and more in a conversation with *Coller Venture Review*. An edited version of the interview appears over the following pages.

Coller Venture Review —
You were one of the top 10 CEOs sitting in front of U.S. President Joe Biden a few months ago. Reflecting back on your recent experiences, what insights did you share with him on improving efficiencies in the supply chain?

Kriez —
I started by talking about how Mattel was able to put products on shelves and cater to strong demand for products. But interestingly, a lot of our dramatic changes across key parts of the operation started before the COVID pandemic as part of our own restructuring, reformatting, and redesigning. We pre-planned. We moved to a more capital-light model, improved the way our supply chain functions, and consolidated the number of factories that we own to focus on the more successful items.

Bottom line – we grew and strengthened our capabilities and became more oriented toward an omnichannel (online plus retail store) environment.

So when COVID happened we already had a flexible platform and operating model, one that allowed us to reorient the company quickly. Our ability to anticipate some of the disruptions in the supply chain and to accelerate manufacturing of certain key products played a really important role in how we were able to perform in the earliest days of the pandemic. By early 2022, we had grown market share for five quarters in a row.

> **Given the fact that we own the underlying IP, we are looking to engage consumers, wherever they are and in nearly any form they wish**

CVR —
Speaking of bringing new products to market, there are a lot of new technologies entering the traditional toy space. So we have to ask – do you see this technology as an opportunity or threat?

Kreiz —
As the owner of incredible brands, we absolutely believe that there is a significant opportunity to grow our digital gaming business to increase brand engagement and create a holistic experience around our franchises. Given the fact that we own the underlying IP, we are looking to engage consumers, wherever they are and in nearly any form they wish.

Of course, we start with the assumption that physical games and physical play are absolutely here to stay. In fact, it's growing–this part of the toy industry is expected to reach $100 billion next year, and it is expected to continue to grow at over 5% through 2025.

But we also see that kids spend more time on screens. Obviously, children are able to multitask and do several things at the same time. So it's not a zero-sum game.

We are also learning from the great companies that have come before us. For example, Marvel used to be a comic book publisher. When Disney acquired Marvel, they realized that there was an opportunity to extend the brands that used to be in comic books and leverage them into other domains. The rest is history. We're not saying we'll achieve what Marvel did–the brands are different, and every company has its own journey–but we absolutely believe that our brands are so strong that the opportunity is there. We believe that the strength of our franchises combined with our own capabilities put us in a very exciting position.

Finally, we focus on impeccable execution and imagination, coupled with a global platform to achieve results. While the anchor of our core experience is physical play when we launch a new toy, we think about it as franchise management, whether it's on television, short form, social media, games, or a movie. This is a key part of our strategy – creating a wholesome, complete, immersive experience around our brands. We extend the physical play and make it an immersive experience for the consumer.

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CVR —
It seems challenging to imagine all the ways in which you engage with sense of play, which as you've pointed out is relevant to many different fields. Can you explain?

Kreiz —
Most broadly, play is perhaps the most common language of all. And the language that we speak is play. Our brands create the initial attraction and emotional connection that consumers look for. More tactically, we can't just wait in the toy aisle for consumers to come and purchase our product, we need to reach out, engage, and find them, wherever they are, to create a holistic offering that complements a full engagement around our brands.

Ultimately, it is about quality experiences and the quality product that we create through innovation and creativity. If you do that, right, everything falls into place. This has really guided us so far and is what is driving our incredible momentum, especially this year. Our company now is in growth mode, driven by these core values, centered on creating innovative products and experiences that inspire, entertain and develop children through play. In a nutshell, as I've said, we are looking to engage consumers, wherever they are, and in any form that they wish to do it. The opportunity is to reach and engage in and touch consumers in digital as well, but we're not the first one to do it. What we do is take something that is almost obvious and extend it to new domains.

CVR —
Clearly, strong IP property is associated with a privileged positioning and helps to make new inroads easier to achieve. How specifically does the underlying IP help direct Mattel's growth?

Kreiz —
Big brands focus on meaningful consumer engagement and those that have a built-in fan base with global awareness with high emotional connection will thrive. This is true for film, television, live events, consumer products, merchandise, digital games, mobile consoles, and so forth. The level of engagement with our product – the things that kids touch, hug, and go to bed with – is a source of inspiration. We believe that that level of connection and engagement can and should be translated to other highly accretive business verticals.

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What does this mean? Well, films for example are a key part of our strategy because they are very big and an important part of the entertainment industry, with global impact and very high awareness. If that happens, good things will happen. We will sell more toys. But note – we are not making movies to sell more toys; we are looking to make great content, including content that people will want to watch.

At the end of the day, we manage franchises, and our franchises have core attributes, certain values… they have a purpose. Being purpose driven is a key part of our success and why our products resonate at levels we have not seen in years. They appeal to parents, they appeal to children, and they reflect values that families really care about.

Note that the brands and franchises that we own go back to as much as three generations, with global awareness. What's interesting is that the level of engagement with our product – the things that kids touch, they hug, that they go to bed with – is a source of inspiration AND that level of connection and engagement can and should be translated to other highly accretive business verticals – film, television, live events, consumer products and merchandise, digital games, mobile consoles, and so forth.

Given the strength and quality of our franchises, our success is going to be very meaningful and even transformative. We are pursuing it in partnership with some of the best creators out there that have done it before and believe that with our brands, they can do it again – to film, television and digital games.

CVR —
Can you give us an example of this?

Kreiz —
Barbie is a great example of this – Barbie today is much more than a doll, it is a cultural icon. Barbie is one of the strongest brands in the world and the number one toy property globally overall. Not just for dolls in 2021, but overall, in all age groups and all categories. Following this, we are preparing to release the Barbie movie in theatres globally in July 2023. It is directed by Greta Gerwig, with Margot Robbie playing Barbie.

But the real point here is that, in many ways, Barbie is a reflection of Mattel. Barbie today is much more than a doll, and there will be more opportunities for Barbie as well as for our other brands. When you look at Barbie, and its extensions, it is a reflection of how Mattel operates – how we understand and grab the opportunities we see in front of us, and galvanize energy to drive a diverse portfolio.

There are other great projects that we're developing already as well, we announced 14 movies in the works and a lot that is happening on the episodic sides, which we call Mattel Television. We know today that when you work in television it no longer means a weekly show – but is really an episodic experience.

We've recently launched a live action movie, Monster High, that premiered on Nickelodeon with incredible cinematic quality. A second film has been greenlighted. Bottom line, we are seeing and driving a lot of momentum and excitement around the content activities.

CVR —
How would you say this translates into the management and motivation of your team?

Kreiz —
We are on a journey to create significant value in the toy in the toy aisle, and it's an exciting industry in and of itself. It's a growing industry, and we can do a lot of things there. But the opportunity is, in addition to what we do on the toy side, to expand into these other verticals.

But the mandate for our own film group, and it's a small team, is for them is to make great content and attract the best talent. That talent is in how that team will take our brands, reimagine them and create great experiences for consumers all over the world. With that approach, we have been able to attract and collaborate with some of the biggest filmmakers of our times, across multiple genres.

This is part of the magic to see how those creative people can turn our franchise into special experiences and on the big screens, as well as on the home screens through the streaming platforms and television channels.

But there are a lot of other things to think about. Mattel is obviously highly operational and has a global footprint. We really do have a great team, composed of good people, we work strongly together and my main focus is to ensure that our people have the best environment, the best tools, the best capabilities, resources and infrastructure to do a great job. You always have to look around the corner, and expect the unexpected. But as a whole, once you set the goals and the strategy, it's all about empowering our team to aim towards those goals and focus on execution and getting things done. We have covered a lot, it's been a long, long journey and we are in a much different place today than we were just a few short years ago and we're now orienting towards growth. It's a new phase, and it does take a different approach. But with all the work that we've done over the last few years, we are in an excellent position to achieve what we what we set out to do.

> **The language that we speak is play. More broadly, play is perhaps the most common language of all. Our brands create the initial attraction and emotional connection that consumers look for**

Evolution of a cultural icon

1959
Barbie's debut – March 9, 1959

2014
Launch of @barbiestyle Instagram account

2022
Barbie enters the metaverse with NFT collaboration with Balman

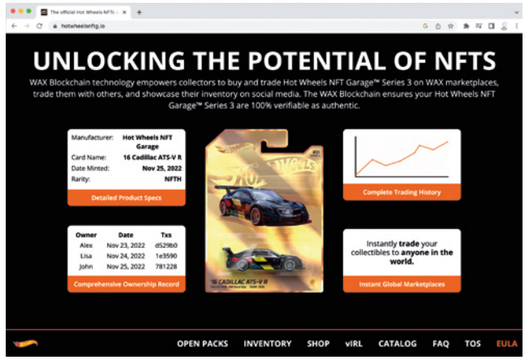
2023
The Barbie movie scheduled for global release in 2023

Above image: ©Mattel

CVR —
From your perspective as an IP holder and brand builder, can you share your perspective on NFTs?

Kreiz —
NFTs are a really exciting situation and shine a light on the type of opportunities we think about. They didn't exist and suddenly they're growing fast. We see that the industry will go through different phases and transformations. To actually buy an NFT is not simple today and this process will become a lot smoother and a lot more user-friendly over time. We also expect that some of the hype will eventually rationalize and interest will focus on big brands that have communities around them, with people that share the same passion, values, and aspirations.

Regardless, we see the ability to engage with brands in the metaverse and the combination of the physical with the virtual. For Mattel, we own the underlying rights, which gives us the opportunity to participate in both physical and virtual domains, with NFTs a real part of the experience. We're very excited about this–we were the first toy company out of the gate that launched an NFT product with Hot Wheels last year. The latest partnership with Balmain is another example not just of how we can play in the NFT space, but also the type of partnerships that we can do, where the appeal that the brand has is way beyond the toy.



Above: The Hot Wheels NFT Garage website.

CVR —
How do you expect continued innovation and the spirit of entrepreneurship be felt at Mattel in the future?

Kreiz —
I have always been guided by innovation and execution against any given innovation. I believe in innovation, in always trying to reinvent, improve, optimize, and push the envelope to find a way to do things in a better way – no matter the shape in which you find something, there is always a way to do things better. Innovation is a big word and kind of a headline way to describe ways to improve and to become more productive and more creative. This is not just about being a creative designer or developer of a toy, in the case of Mattel, but in truly thinking out of the box.

As for execution – getting things done – we're here to achieve goals, whatever they are. But it doesn't necessarily have to be financial goals. We always have to ask: Are we achieving our goals? Are we getting things done? What did we achieve at the end of the day?

CVR —
How do you see your work affecting the broader culture and, reciprocally, the broader culture affecting Mattel?

Kreiz —
As the play pattern becomes more sophisticated and more holistic – and more immersive – we have to think about the impact of our launching a new toy, or extending IP whether it's on television, short form, social media, games, or a movie. Our brands matter because they represent emotional connection.

This goes into purpose and what parents think, what is my child getting out of it beyond the physical play? Or beyond the time they spend with it? Are they entertained? Are they inspired? Do they learn something new?

Our company also has cultural impact on a global scale– this matters to our consumers, to people around Mattel, to our employees, and to our constituents. When you do and say things, there are implications one has to consider and take into account. Doing so earns people's trust, and we know the rest takes care of itself.

In order to deliver authentically, I believe one needs to earn the respect and trust of a range of communities and the people. We see trust as a core brand promise to what Mattel represents. Trust is not just about the safety and quality of what we make, but also what we stand for, what we represent, and how we stand by our commitments at the business level, the human level, and the personal level.

Kreiz —
Our clear aim at Mattel is to contribute to a more diverse, equitable, inclusive and sustainable future. We can't do it alone but we absolutely try to contribute. When Barbie is promoting diversity and inclusivity and empowering girls to reach their unlimited potential, it resonates. People say it impacts and influences consumers and helps advance the world to a better place. Likewise what we do internally in terms of the product we make, our impact on the environment, and sustainability is a very important part of how we factor our planning and design product and manufacture products, whether at our own factories, or even when we outsource manufacturing to third parties. Our company takes itself and our role as a corporate citizen very seriously. This is very important for me personally and it's very important for the company, and it's something that we put at the very front of our thinking, every day.

> "The latest partnership with Balmain is another example not just of how we can play in the NFT space, but also the type of partnerships that we can do, where the appeal that the brand has is way beyond the toy"

In sustainability the commitment is to achieve 100% recycled recyclable or bio-based plastics material in both products and packaging by 2030 and we are already making real progress towards that goal. Likewise, we made other commitments regarding reduction of greenhouse gas emissions, to using sustainable materials and recycled materials. We are taking steps gradual but significant steps towards those goals to deliver on our commitment, and yes, it is a key part of who we are, what we stand for, and how we operate as a company.

CVR —
Last year, there was over $26 billion invested in Israeli companies. Has Mattel considered investing?

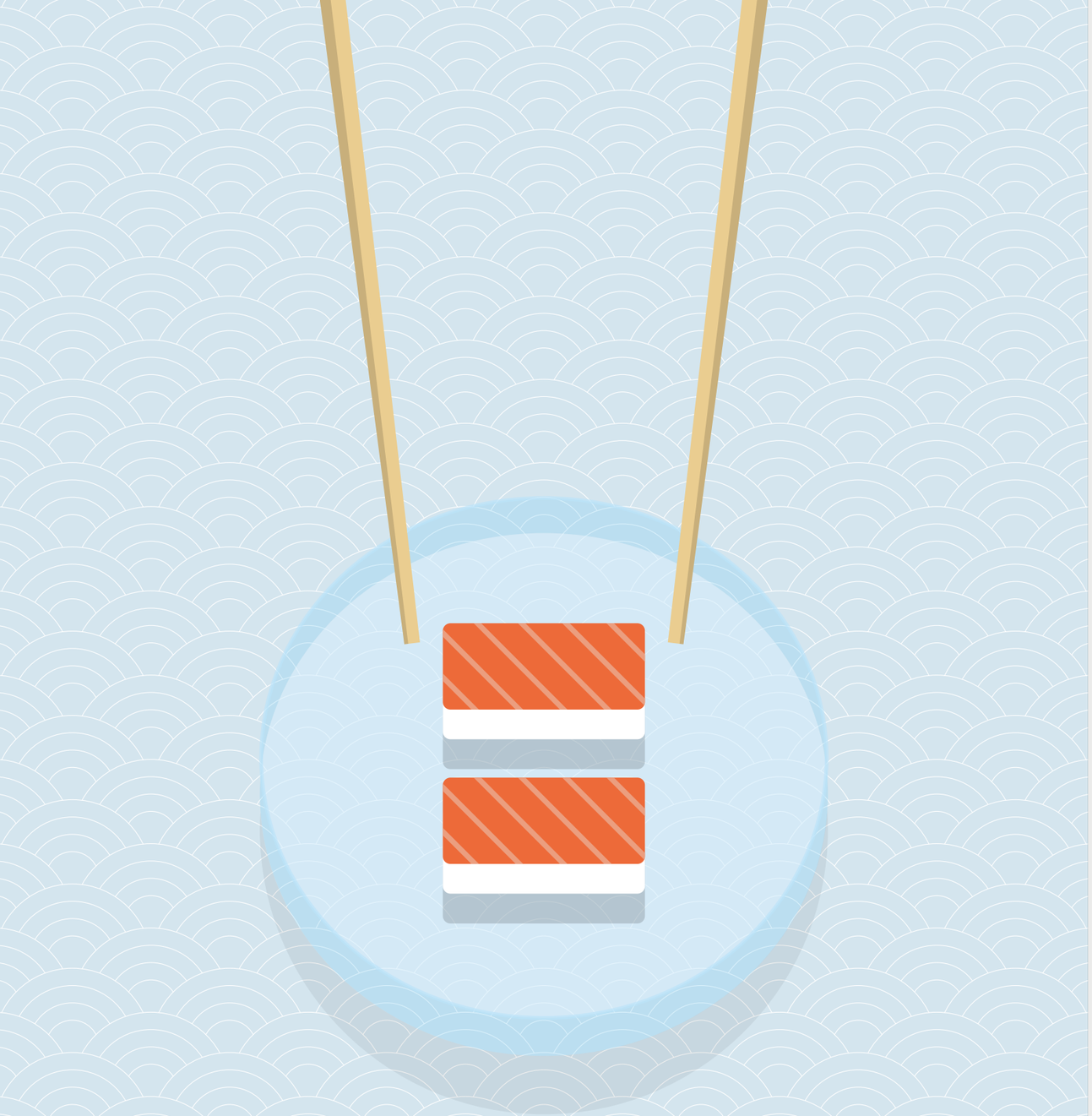
Kreiz —
We are always interested where there is fertile ground for innovation and new technologies. As for Israel, knowing the country and the people as well as I do, I'm not surprised that there is a lot of talent in every field and every part of the economy. I believe in the continued growth and further opportunities. This is something that we as a company are also interested in exploring– we are looking to collaborate with Israeli startups and Israeli technology companies to accelerate what we do, even as we give those companies access to our platform and resources.

CVR —
Thank you very much. I think for sure you're inspiring to many people here in Israel, and especially at Tel Aviv University, we're going to be hearing a lot about what you've done and what you've achieved. So, I wanted to thank you very much for giving your time. ■

About

Ynon Kreiz is the Chairman and Chief Executive Officer of Mattel, a global toy company. Throughout the first three years of his tenure, Kreiz transformed Mattel into an IP-driven, high-performing company, improving adjusted Operating Income by more than $960 million. Kreiz's transformation into the IP space has led his company to begin production on a Mattel film franchise, including Barbie and Hot Wheels movies. Prior to Mattel, Kreiz was the Chairman and CEO of Maker Studios and the Endemol Group. He received his MBA from UCLA Anderson School of Management and his Bachelor of Arts degree in Economics and Management from Tel Aviv University.

Ed Frank is the Founder and CEO of Axis Innovation, a Tel Aviv- based open innovation consultancy which focuses on bringing cutting edge technologies to its clients to create growth, solve problems or invest. Prior to Axis, Ed was CEO of IDT Ventures. With over 20 years of tech experience, Ed has been involved in technology as an entrepreneur, industry expert, investor and deal maker. Ed has an MBA and BS in engineering, both from Columbia University.



Natural, Artificial, Ethical? How Synthetic Biology Is Overturning Old Categories

Virginia Postrel
Visiting Fellow, Smith Institute for Political Economy and Philosophy, Chapman University

Draped over a neat mound of rice, the slice of raw salmon glistens. I follow sushi chef Jun Sog's directions and eat the nigiri in a single large bite. The salmon's flavor is delicate, not fishy, the texture silky against the grains of the rice. Then the hidden wasabi kicks in, a sharp contrast to the mild fish. I relish the punch while stifling a cough.

Before taking this job, Chef Jun spent three years preparing 14-course offerings at a Michelin-starred San Francisco restaurant. Sophisticated diners paid a couple hundred dollars each for a chef's choice meal, or omakase, whose inventive dishes featured fish flown in from Tokyo's Toyosu Market.

The nigiri and salmon rolls he's making today are just as special, but their extraordinary character is harder to discern. The only hint is the shape of the salmon from which Chef Jun slices his elegant portions. It's a fat rectangular block with rounded edges, like a Milky Way bar. Fish markets don't sell salmon that looks like that.

We are at Wildtype, a San Francisco startup that grows sushi-grade salmon from cells. The product I'm sampling descends from cells taken from a small fish more than three years ago. "We haven't had the need to go back to the animal since that time," says co-founder Aryé Elfenbein, a cardiologist who earned a Ph.D. by researching how blood vessels form.

Wildtype scientists coaxed the original fish cells into becoming what are known as induced pluripotent stem cells. Like early embryonic cells, these stem cells can grow into any type of tissue, depending on the cues they get from the environment. Using the right nutrient mix and a mesh-like scaffold, Wildtype gets them to become muscle, including the connective tissue that forms salmon's

distinctive white lines. The resulting salmon has no bones, no skin, no blood and guts—no waste. "We only create what we eat," says Elfenbein.

He grew up in Australia and says his aha moment came on a trip home during his medical residency. He was distressed to see former rainforests converted to raising cattle. "That made me wonder," he recalls, "Could we eat meat and not eat animals? Can we grow the same thing, just outside of the animal?"

Founded in 2016, Wildtype is one of a host of new companies turning to cutting-edge biological techniques, known collectively as synthetic biology (or synbio), in search of more environmentally friendly, less ethically fraught materials. Some offer alternatives to existing products, such as the popular vegan burgers Impossible Meat introduced in 2016. They get their beefy flavor from heme, the iron-rich molecule in blood. Others, like Wildtype's salmon or Huue's indigo dye, provide duplicates of existing substances, created in new ways.

Above: Wildtype co-founders on Puget Sound.

Image: ©Wildtype

> "Synthetic biology is a process, not a product. Unlike corn genetically modified to grow faster or repel insects, the DNA tweaks don't show up in the final product"

Synthetic biology is a process, not a product. Unlike corn genetically modified to grow faster or repel insects, the DNA tweaks don't show up in the final product. Impossible Meat gets its heme by giving yeast a soybean gene that makes it produce a heme-rich molecule. It grows the yeast in fermentation vats and separates out the heme.

"What we're talking about here is a revolution fundamentally changing the way that materials are made," says Michelle Zhu, the chief executive and co-founder of Huue. She envisions a "future where we eliminate reliance on petroleum and fossil fuels and polluting production processes, instead being able to work in harmony with nature to create nontoxic colors, and other kinds of nontoxic materials."

Synbio executives talk like nature lovers and environmental activists. "We are a company that makes meat from plants to turn back the clock on climate change and restore biodiversity," says Jessica Appelgren, vice president of marketing at Impossible Foods. Dan Widmaier, the co-founder and chief executive of Bolt Threads, says, "We see the world as a four-billion-year-running experiment of inventing materials that are perfectly sustainable and circular." Bolt's products include a silk protein to replace silicone elastomers in cosmetics and a leather alternative made from mycelium, the tissue forming the roots of mushrooms.

Someday soon, goes the new biological vision, we'll wear jeans dyed with indigo made using bacteria and walk on flooring formed from mycelium. We'll dine on cruelty-free beef grown from cow cells and eat ice cream whose flavors and milk proteins were excreted by microorganisms. Corn farmers will replace synthetic fertilizers with soil microbes engineered to convert nitrogen from the air. Instead of animal hides, leather will come from cell cultures—animal cells for traditionalists, mycelium for vegans. Chemical companies will abandon petroleum feedstocks for corn syrup and customized enzymes.

And that's just the beginning. Who knows what unknown flavors, fibers, or construction materials the new biology might yield? Given a few decades, its enthusiasts imagine, substances grown with biology will be as much a part of our everyday lives as petroleum-derived products are now. Pastureland will return to forest, wild salmon will again swarm the streams, and carbon emissions will fall. The world will enjoy ecologically benign abundance.

"We have spent the last century looking at what can we do with chemistry. And at this point, we're kind of tapped out in what we can do with chemistry," says Ena Cratsenburg, the chief business officer at Ginkgo Bioworks Inc., an industry pioneer. People still want the chemical products that improve human life, but without the environmental costs. "We think there's a better way to do it," she says. "Biology is a better way."

That approach represents a significant cultural shift.

> "Given a few decades, synthetic biology enthusiasts imagine, substances grown with biology will be as much a part of our everyday lives as petroleum-derived products are now"

Since the first Earth Day in 1970, businesses large and small have grown from the conviction that "natural" foods, fibers, cosmetics, and other products are better for people and the planet. It's an attitude that harkens back to the 18th- and 19th-century Romantics, who rejected industrialism in favor of sublime landscapes and rural nostalgia: What's given is good; what's made is suspicious, especially if it's mass-produced or of recent origin. The natural is safe and pure, authentic and virtuous. The artificial is tainted and deceptive, a dangerous fake.

That view is still culturally potent, with its own intellectual ecosystem of publications and advocacy groups. They want nothing to do with the new biology, however fired with environmental zeal its advocates may be. "Cell-cultured meats are imitation foods synthesized from animal cells, not meat or poultry that consumers know," says Jaydee Hanson, the policy director for the Center for Food Safety. The activist group is lobbying the U.S. government to require that lab-grown meat carry off-putting labels like "synthetic protein product made from beef cells."

Since the first Earth Day in 1970, businesses large and small have grown from the conviction that "natural" foods, fibers, cosmetics, and other products are better for people and the planet. Synthetic biology represents a significant cultural shift

Above: A cross section showing mycelium, the underground root-like system of fungi.

Left: Mylo, a material that looks and feels like animal leather, made from mycelium.

Images: ©Bolt Threads

"If you are eating 'animal-free' dairy or meat products that taste nearly identical to a traditional animal product, you should be asking plenty of questions," warns organic-food guru Max Goldberg in an essay. "And more often than not, what you will discover is that these foods are anything but 'natural.'"

He has a point. Ginkgo's Cratsenburg, who has been in the industry since 2006, defines synthetic biology as "a form of science that takes the engineering principles that one would apply to other engineering disciplines and applies them to biology." Engineering identifies regularities, establishes repeatable processes, and makes outcomes predictable. Nature, by contrast, is out of control and indifferent to human purposes. Engineering bends nature to human ends. It is a science of the artificial.

Take Brave Robot ice cream from Perfect Day, founded in 2014 by two self-described "struggling new vegans." Goldberg uses a photo of its booth at a natural foods trade show to illustrate his anti-synbio article. He sees the booth as a misleading abomination. The ice cream is an animal-free dairy product—something that does not exist in nature (Neither, of course, does ice cream itself.) Brave Robot genetically tweaks microflora so they turn out whey protein. It's the same substance in cow's milk but without milk's other ingredients, such as lactose or animal fats. For its ice cream or cream cheese, Perfect Day adds in plant oils. Voilá: animal-free dairy.

Reviewers and my own taste tests confirm that Brave Robot's ice cream is indistinguishable from the traditional sort. The Perfect Day customer, says company spokeswoman Anne Gerow, is "anyone who loves to eat but really cares. They care about animal cruelty or they care about the future of our planet." If artificial methods make their goals easier and more delightful to achieve, so much the better. The new biology enables ethical living without sacrifice. Bring on the animal-free mint chocolate chip!

"This is the cleanest salmon you will ever have in your life," boasts Wildtype co-founder Aryé Elfenbein. It contains nothing but fish: no parasites, no mercury, no microplastics. Wildtype knows everything about the salmon because it grew the tissue in a vat

Purists aren't convinced. One advocate of "clean eating" relentlessly posts links to Goldberg's warning on the reviews on Brave Robot's Facebook page. To her, clean eating means eschewing artificial ingredients. Animal-free dairy products are clearly taboo. Like the ancient prohibitions of kashrut, this concept of "clean" draws tribal boundaries, affirms identity, and makes food meaningful. The impurities it shuns are as much spiritual as physical. But while this notion of cleanliness is powerful to adherents, its appeal is limited.

The new biologists counter with their own purity claims. "This is the cleanest salmon you will ever have in your life," boasts Elfenbein. It contains nothing but fish: no parasites, no mercury, no microplastics. Wildtype can tell the exact amount of omega-3 fatty acids in each portion.

Elfenbein bristles when reminded that the salmon's purity comes from its artificial nature. He'd rather talk about transparency, a word with nicer connotations, and envisions detailed labels listing everything from the salmon's carbon footprint to the day it was made. But Wildtype knows everything about the salmon because it grew the tissue in a vat. And it's the precisely controlled environment of the cell culture that ensures that the raw salmon is free of dangerous worms. (Wild or farmed sushi-grade fish must be frozen to kill parasites.) Nature isn't clean.

The new biology faces a more suspicious market than the postwar America that embraced the gospel of miracle fabrics, wonder drugs, and convenience foods. That naive message produced a backlash. Our era is more like the economically and technologically tumultuous 19th century. Progress comes with obvious disruptions, giving rise to muckrakers and intellectuals eager to demonstrate its dark side.

“For a half century we’ve been telling ourselves a story about technology as a fall from grace, about artifice as the source of human suffering and environmental ruin—even as we consumed more and more of its products. The idealistic scientists and entrepreneurs building the new biology tell a different story, a story of life and renewal”

In a more affluent world where tolerance for risks has fallen, the predictability of artifice can deliver a sense of security, just as it did around the turn of the 20th century. Americans then began to enjoy “artificial ice.” Instead of blocks cut from frozen lakes and shipped to cities or southern climes, people began to buy ice made from distilled water in factories using ammonia-based refrigeration. At first more expensive than natural ice, factory-made ice nonetheless found a market among customers anxious about impure food and water-borne disease. Both were serious problems in burgeoning industrial cities.

“The demand for artificial ice has been increased by all citizens who are careful to look after the wholesomeness of their food and the general health of their homes,” reported the Fort Wayne, Indiana, newspaper in 1900, noting that “butchers who want no impurities in their ice chests are making a great demand for artificial ice” and “a dutiful mother will have nothing but pure ice for her children.”

People didn’t buy artificial ice because they were wowed by the technology, although it did get some gee-whiz press. They bought it because they wanted to be good mothers and dependable butchers. They wanted to live in big cities without eating rotten food. They wanted to go ice skating, eat ice cream, and enjoy cold beer. Artificial ice made everyday life better. And its story made sense. People understood that ice was frozen water and that pure water made pure ice. They didn’t have to understand the stuff about condensing ammonia.

Image: ©Wildtype

Wildtype hires sushi chefs so its fish makes sense. While it waits for regulatory approval, the company invites guests to see and taste the product the way they would in a restaurant. The familiar ritual sparks curiosity rather than fear. How long does it take to grow, people want to know, and where do the white stripes come from? Could you make the flavor more intense? Once the product is on the market, Wildtype hopes restaurants can tell its story. Most people don’t, after all, make their own sushi.

Over time, growing meat or silk or leather in a vat could make the “natural” alternatives seem aesthetically and morally repugnant. Eating pond ice sounds repulsive nowadays. Who knows what might be in it? And, as uncomfortable as the thought may be, economics and technology can transform ethical expectations and practices. Infanticide dwindled in Europe as condoms spread and living standards rose. The lower the cost of virtue, the more willing people are to embrace it. Most contemporary diners don’t want to give up meat but also don’t want to see exactly where it comes from. By offering kinder alternatives that don’t sacrifice taste or tradition, synthetic biology can change mores.

Ideals and stories also matter. By making muscle power less essential, steam engines probably helped along the abolition of slavery. But novels, slave narratives, and Christian lessons of common humanity were essential. For a half century we’ve been telling ourselves a story about technology as a fall from grace, about artifice as the source of human suffering and environmental ruin—even as we consumed more and more of its products. The idealistic scientists and entrepreneurs building the new biology tell a different story, a story of life and renewal. If we cherish nature, they suggest, we’ll embrace artifice. In this story, synthetic biology offers a kinder, safer, more planet-friendly way forward. ■

About

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Deep Innovation

Innovation from Robotics to New Models of Venture Investing and Data Analytics

Overview

Our *Deep Innovation* section frames questions related to transformation a little below the surface. In this case, we trace the genesis and now impressive success of Fort Robotics, which facilitates autonomous manufacturing for dozens of Fortune 500 companies and leaders in robotics and AI development.

In a collaboration between Prof. Justin Levinson of the University of Hawaii and venture investor and GP Tim Young of Eniac Ventures, we are also exposed to a new framework for venture investments. Levinson and Young look thoughtfully at how different investment paradigms have functioned, and how they might be improved within a broader moral framework. This includes new and creative business models aimed at realigning resources in a way that leverages what blockchain has to offer, specifically to help remedy environmental harm and consumer fraud.

Finally, we are joined by Neil Hoyne, Google's Chief Measurement Strategist, who contributes his perspective on the way in to building – and measuring – meaningful and long-term customer relationships

Future versions of this section will continue to bring together varied perspectives on new frameworks and technologies, with the aim of promoting new syntheses and insights.

How “Stopping” Helped Fort Robotics Keep Going — and Growing

Samuel Reeves
CEO, Fort Robotics

The world of automation is changing. Unlike in the past, machines now have sensors that can let them perceive the world. They have brains that let them think about what to do. They now have different types of actuations that let them do different things. And it all happens at a much lower cost – but also at much higher risks. In this article for the *Coller Venture Review*, Samuel Reeves, CEO of Fort Robotics, describes his journey and challenges as an entrepreneur to capture the opportunities he saw in the robotics market and explains the perfect storm of factors that have transformed smart manufacturing, the emerging risks of these technologies, and how the pandemic impacted the robotics industry.

Entrepreneurs are often asked, "What's the have-to-have part of what you're offering?" In the case of Fort Robotics, a Philadelphia-based automation company that builds and operates smart machines safely and securely, it happens to be a function known as "the stop feature." As its name implies, this feature stops the machine functioning at a moment's notice. How can such a seemingly unsophisticated function be a key differentiator and the "have-to-have" feature of Fort Robotics' products? As Samuel Reeves, CEO of Fort Robotics explains in this article for *Coller Venture Review*, the reason is that in large machines, the failure to stop can mean death. The fact that Fort Robotics' products had the stop feature helped customers recognize their safety. This caused a pattern of widespread acceptance and adoption that propelled Fort Robotics' sales and revenues.

Why was this innovation so crucial to Reeves and Fort Robotics? As the article explains, Reeves started at age 22 in the landmine clearing business. At a time when human deminers were used – often with traumatic or even fatal consequences – to clear conflict zones of buried landmines, Reeves used robots to do the job. Rollers would go in front of the robots to deactivate a mine before it could kill or maim a human. In that context, being able to stop the machine before anyone died was a crucial requirement. That was the origin of the stop function. It is also the reason it remains a critical part of Fort Robotics products.

Another element that is apparent in the emergence of Fort Robotics is that it demonstrates Samuel Reeves's extraordinarily persistence as an entrepreneur. Although serendipity undoubtedly played a role, his tenacity in bringing the landmine clearing device to market, understanding the importance of the stop feature, finding out that this feature was critical not just to demining equipment but also to machines serving other industries, and using that to drive sales is what helped Fort Robotics leap forward. The company doubled its sales during the pandemic, thanks to Reeves's intelligence, resilience and creativity.

> **"The upside relative to what has changed today is huge – estimated at around a $30 billion market in the U.S. when smart machines hit scale. And nobody owns it yet"**

It is understandable how, during the COVID 19 pandemic, companies such as Clorox – that made soaps, wipes and products that kept people safe – grew rapidly. It is less obvious why companies such as Fort Robotics thrived. In addition to entrepreneurial drive and imagination, this not-widely-anticipated bounce came from an opportunity that the COVID 19 pandemic mobilized. Across the board, large manufacturers were focused on safety, the stop feature resonated with them, and they used this time to bring change onto the production floor. These are some key lessons from the Fort Robotics story, and we use it here as a mini case study to illustrate what the often-academic theories of persistence and resilience mean in entrepreneurial practice.

It may sound trite to say it now, but automation is transforming society. We have heard that for a long time. Industrial robot arms started production in the 1950s and 1960s. Machines – like, a lot of manufacturing operations – have been automated for a long time. But the thing that we often don't see is that a machine takes a long time and money to program. Once it has been programmed, it runs for a long time. You don't want to change it because it took you so much time and money to program it. That process is applied to a very narrow aspect of production, which is high volume and low variability. That is how automation has worked in the past in industries such as automobiles and electronics.

The upside relative to what has changed today is huge – estimated at around a $30 billion market in the U.S. when smart machines hit scale. And nobody owns it yet. There is truly a blue ocean opportunity to create a new layer of the tech stack that is being pulled along by an industrial revolution, that's an enabler to an industrial revolution. This is a unique opportunity that doesn't come around very often.

> **"In machine control you're looking for very high reliability. Imagine the networks that control our aircraft and cars and nuclear plants. These are safety critical control networks. That's what we need to have to send an emergency stop signal to a machine"**

At Fort Robotics, we have three elements of creation: Creation of the market, creation of the category, and creation of the technology. There's ambiguity all over there. There's a lot of risk in ambiguity, but there is also a big reward. We're not easy to understand. In machine control you're looking for very high reliability. Imagine the networks that control our aircraft and cars and nuclear plants. These are safety critical control networks. That's what we need to have to send an emergency stop signal to a machine. But with mobile machines, you don't have a wire so, you have to do it over wireless. You have these two forces coming in together – yet safety critical systems and wireless communications have never been together before. We created a way of doing high-integrity information transfer over the wireless networks. We have the experience of a wired safety-critical network, but over a wireless network. We created an overlay that would basically do a virtual control system. With those two things, the governance system that told it what kind of box it had to stay in, and then the safety critical coms, we were able to create a safety approach for this 10,000 lb. autonomous machine with people around it.

We saw the robotics industry growing around us. By 2017, companies were doing things that were similar to what we had done. There was a whole defense robotics community. There started to be the commercial robotics community. Then everybody that makes an existing machine, John Deere, etc., started to have these skunk works projects to make their machines autonomous. At that time, we started to see companies trying to come and buy pieces of our system. So, we started selling this stuff. We realized everybody is going to need this kind of thing.

In 2018, I started Fort going from the vertical application of landmine clearance. There was this crazy industry that was a super niche market, but it had a very high humanitarian appeal. The goal there was, we started with safety, and then grew into security. But the overarching mission was to accelerate automation, to achieve that automation in society. We were motivated by the fact that we were talking about taking three key risks off people's plates – safety risk, security risk, and economic risk.

Our first products have been related to communications. Once we connect every piece of technology that is interacting with a robot, and every human that is interacting with a robot, then we can move on to doing governance of the systems. Right now, we're just focused on communications. In our case, we're trying to create a category here. The category within our customer market is not established. We're trying to invent it. And we are simultaneously creating the technology on which the category is based.

Our investors include financial VCs that manage money for a standard slew of limited partners (LPs), both private and institutional. We have a few angels and a few individuals. Mark Cuban is one of our investors. We have a few entrepreneurs from the robotics and telecom industries who are individual investors and a couple of corporate investors. Stanley Black and Decker is a giant name in construction, and Prologis is the world's largest owner of warehouses. They have multiple tens of billions of market capitalization. Those are the three groups: standard, traditional financial VCs, angels, and strategic.

Dealing with the Three D's

As a career-long robotics entrepreneur, I'm a true believer in the potential for smart machines to make life better for humans. That is often lost in the discussion about smart machines. Generally, discussion about smart machines tends to focus on their risks. There are also conversations about the potential for labor dislocations, and if smart machines will cause job losses. But there's not as much focus on the potential for smart machines to help humans live better. In the robotics business we call it the three Ds: the dirty, the dull, the dangerous. There are a lot of jobs out there in the world that are dull, dirty, and dangerous. The United States has about 4.5 billion injuries in the workplace each year that require some type of medical consultation. This costs employers tens of billions of dollars. That's just the dangerous part of dull, dirty, and dangerous. The dull piece is way beyond that, and the dirty piece is way beyond that.

If we could wave a magic wand and have humanity focused on the things that make people feel alive, productive and happy, and have machines doing the drudgery, wouldn't that be an amazing society? There is a world out there – the "automated society" – that is very compelling. We have been building towards that my whole career, ever since I started my first company, Humanistic Robotics, which built robots to get rid of landmines. In that company, we became a UN contractor. We went into UN peacekeeping operations across Africa in the border region between Sudan and South Sudan. We worked on different UN missions there: Mali, Somalia, Kuwait, and Syria. I think those were the main ones. We ended up clearing thousands of miles of roads in Africa. We produced distinct technology that was more cost effective, easier to service in these environments that were remote in the middle of nowhere, and highly effective. We learned enough to see the potential for smart machines to make life better for humans. That's when I fell in love with the potential for smart machines to create an automated society.

Fast forward, and we eventually spent quite a bit of time figuring out a safety system that could sit between the machine and the artificial intelligence (AI) that governs the machine's behavior. Basically, we let the machine know the boundaries it could not cross. Then we created a way of controlling these machines so that somebody didn't need to be around them all the time. That required a new approach to wireless communications because, if you think about it, if you put a wi-fi network or a private cell network or a Bluetooth node on one of these things, the number of times that our basic communications technologies malfunction is unacceptable for machine control.

Focusing on the Future

If you screen for drive, creativity and raw brain power, you usually can come to a point of getting to know a potential employee's expectations. You need alignment in expectations. I have an executive coach who always says that you should never have expectations. You should only have agreements and commitments.

In building our team we have emphasized five values. We want all our people to deliver a customer experience worthy of loyalty; own their priorities; accomplish the impossible; think out loud; and build together.

Personally, for me, the transition from doing to leading is an interesting point. That's only recently happened. A key for me has been over-communicating my style. My style is pushy and creative and very verbal and full of ideas. I'm thinking out loud all the time. I expect my team to push back when I am working on a crazy idea or getting distracted by something that I'm fidgeting about.

If you don't have that latter part, you just have somebody that's pushy and thinking about a bunch of crazy things all the time. You could go off the rails. So cultivation of the team's capacity to push back against me has been very important. Now in my leadership team, we have an open and fluid relationship because– and we wrote it into one of our corporate values – we are thinking out loud. This was so important in dealing with me that we wrote it into a value, thinking out loud.

We rarely step back to take stock of what's done in the past. We pay attention to the present and focus on the future. After we close a big deal, we say, "Great, where's the next one?" We don't celebrate a lot, just do a lot of driving.

Pursuing Persistence – Surviving a Perfect Storm

Now, we have automation flowing out to every machine, thanks to a perfect storm of forces. It's not just about programmability. This is not first-generation automation; it is much more intelligent. Machines now have sensors that can let them perceive the world. They now have brains that let them think about what to do. They now have different types of actuations that let them do different things. It all happens at a much lower cost and a compressed time frame. The cost and the timeframe had a critical bearing on what happened in mobile phones. In mobile phones, processing and sensors and the inputs to robotics made them cheap and super capable. That was one of the elements of the perfect storm.

Another element of the perfect storm has been that all the components got cheaper. All the technology required in terms of AI and perception got better. And then we had macro-economic factors such as labor shortages in every production environment. Consider industries such as mining or transportation. Every one of those areas has seen labor shortages. Rather than pay high costs for scarce labor, automation is cheaper. Automation is possible ➔

> "We are putting these machines that can kill us in the same place with humans, sharing workspaces, and they're not smart enough all the time to fully perceive the unpredictable world around them"

because the technology is better, and it is required because labor is scarce and expensive. Those are the elements of the perfect storm. There is a drive to automate production and to do it differently than we did in the 1960s.

As these changes happen in automation, what new risks has this created? That is a loaded question. Safety and security risks are paramount. We used to have machines that were programmed or we had a mobile machine that only did whatever a sensor told it to do, nothing else. Now we are taking smart machines and removing the fences and having people around them and having them think on their own. And then we are connecting them to the internet. The software is so much better, but it still doesn't actually perceive the world around it in a super safe way. These machines are still, compared to humans, kind of dumb.

We are putting these machines that can kill us in the same place with humans, sharing workspaces, and they're not smart enough all the time to fully perceive the unpredictable world around them. That is a major safety risk. Then we connect them to the internet, so that adds to the security risk.

The security risk is different for this kind of system than it is for a standard company. If a standard company gets breached, it's a data-loss problem. It's usually a financial problem, and a customer trust problem. Those are non-physical problems.

In contrast, if a manufacturing operation or a physical environment gets breached, you can have major safety risks. You could have machines that go crazy and kill people. Machines can plow down warehouse racks. They can poison the water in a water treatment plant. Machines can overload an oil refinery or a power station. They can mix the concrete wrong so two years from now maybe a bridge might fall down. These risks have physical world implications. Cyber security risks are truly, truly terrifying in a way that the world has not yet fully appreciated.

Some companies have appreciated them in the national security or critical infrastructure business. But I don't think the average humans have appreciated how integrated into the Internet our basic services that run their lives are, and how the physical world connects with the Internet. We are concerned with the safety risk; we're concerned with the security risks. We have built a platform to address them for the next generation of automation.

Yet another risk will be taken care of over time, but we are still working to address it, which is that everyone's really excited about this world of smart machines. We can all see the benefits. But the fact is, there are no platforms to build on yet. So, the smart machine world looks like the Internet did in the 1990s, where everybody bought all these servers and they had to spend many millions of dollars just to get up and running. And you had to have rooms full of people. It was all very hard and bespoke.

You take that kind of format, and you add the physical world. The physical world makes everything harder. It means that starting a robotics company, starting a smart machine company, or doing a smart machine retrofit to a production environment is something that takes a really long time to do. It takes a lot of money to do. It's just painstaking engineering and manufacturing rollout and installation.

That's another thing that we need to address – economic risk – by providing platforms that mean the people have to build less themselves internally. Smart machines are at this interesting point. They have proven their return on investment in enough cases for people to believe that there's going to be huge scale there. We all believe in this industry that it will go from proof of concept to scale within the next few years. But the longer this kind of painstakingly bespoke economic dynamic persists, the harder it will be for these machine companies to reach scale.

“We all believe in this industry that it will go from proof of concept to scale within the next few years. But the longer this kind of painstakingly bespoke economic dynamic persists, the harder it will be for these machine companies to reach scale.”

It's not a question of whether it will happen. It's a question of when it will happen. But it all has to go together in a coalition. The developers, the users and the investors of the machines have to be making enough progress. Everybody has to benefit along the way for the coalition to stay together.

If it takes too long to develop these machines, then I would worry about seeing an investment winter. You see that right now in the lidar space, for instance. Lidar is this type of sensor that goes on smart machines, especially on cars. It's viewed as a major input to autonomous vehicles. That got substantial investment five years ago. Hundreds of millions, billions of dollars were invested in lidar.

Then, these companies built themselves and they tried to get deals with OEMs and some of them did well and some of them failed. Some of them consolidated, and some went public. Now, if you're raising money for a sensor company, you will probably have a hard time.

I don't want there to be an investment winter in smart machines. That means the coalitions will need to stay together, and it also means people need platforms to build on to make it cheaper and faster to build smart machines.

The Pandemic's Impact

What impact did the pandemic have on the smart machine market? There's the stock answer that applies to everything, and then there's a nuanced answer. Let us consider both.

The stock answer is that crises like the COVID 19 pandemics accelerated every trend by 10 years. Smart machines are no exception. If a bunch of these startups and smart machine suppliers were planning on scaling in the next 15 years, now they could look at scaling over the next five. In general, the pandemic was that kind of shock.

The reality is more nuanced. There was a labor shortage in every one of these environments, as I stated above in my discussion on why we went through a perfect storm. There was a labor shortage in every one of these environments before the pandemic hit. It made labor shortages worse, for sure, but they already existed. People were already working on this.

But then the pandemic accelerated a few sectors tremendously, like e-commerce. The e-commerce acceleration has been very well documented. Consider autonomous trucks. I think the pandemic and the supply chain shortages and the supply chain disruptions fed the decoupling of autonomous cars and autonomous trucks. This is because autonomous cars are mainly useful in city centers where there's high density, while autonomous trucks are mainly useful on the highway. These, from an autonomy perspective, are different levels of difficulty. We can have autonomous trucks today for limited routes. Autonomous cars in dense urban environments are harder.

So, in terms of the pandemic acceleration, we saw a major uptick in anybody doing robotics for e-commerce. That applied to robot arms that were picking up packages and putting them in boxes or unloading crates and putting stuff away. There are a lot of things in a warehouse or distribution center that a robot arm can do. All those activities saw an acceleration.

Accelerations also occurred in other industries. Construction was one of them. This industry has been dealing with labor shortages for a long time, and the technologies are a little further away from prime time. You may have wished that you could do autonomous construction because of the pandemic, but it was not possible to push a button and accelerate it as much as it was for warehousing. Also, a lot of those environments were outside. Social distancing was more possible. That kept construction going a little longer than expected.

Agriculture is another area where there was already a major labor shortage. Berries were dying on the vine. The world's projection of food needs has been substantially outstripping our current ability to make food. We need automation in order to fill that gap. The macro long-term trends remain the same.

> **In machine control you're looking for very high reliability. Imagine the networks that control our aircraft and cars and nuclear plants. These are safety critical control networks. That's what we need to have to send an emergency stop signal to a machine**

Many of the technologies are almost there – as in the construction industry – but they are not yet ready for prime time. You cannot simply press a button and turn them on, as we could in e-commerce. Activities like picking a weed or picking a berry are hard to do from a robotics perspective. A lot of companies are still working their way through these challenges. But it's inevitable. If the pandemic did anything for funding, it will have pulled in the eventual date by which that kind of technology sees the world.

Another area that's very frothy in robotics and smart machines is turf care. We have seen a major acceleration in autonomous mowing. Those companies are out there, proving ROI and making scale. Again, that was a labor shortage issue before the pandemic, and it has just continued to grow from a smart machine perspective.

Mining was already fairly autonomous before the pandemic. I don't believe it has changed course. In general, we pulled in the date at which some of these technologies go prime time. We had a few examples of major accelerations. We didn't know what to expect when the COVID 19 pandemic started. The general thought in startup land when the pandemic hit was, we need to conserve cash. Nobody is going to invest. Nobody is going to buy. There's going to be no economic activity. There's going to be no investing activity. Do layoffs or public-private partnerships, or whatever one needs to do to survive.

At Fort Robotics, we doubled our revenues during the pandemic. It was really interesting. We polled our clients. They told us, nobody's sitting out the fastest industrial revolution that our people had ever seen. Nobody's sitting that out because there's a pandemic. The fourth industrial revolution is still happening. While there was some initial thought that the pandemic was going to be disruptive, it was positive from a business perspective, if you leave aside the obvious human cost. Obviously, no one can claim that the pandemic was good. But if you were to leave aside the human cost, it was positive for the smart machine industry because of the acceleration. It took a few months for people to realize that.

Resilience in Facing Future Risks

Which areas will see the greatest risks in the future? I have been thinking a lot about this. I am going through all my verticals, and thinking through the safety, security, and economic risks.

From a safety perspective, the larger the machines, the greater the risks. So far, a lot of the e-commerce robots have been small. A lot of the new industrial robot arms, like the collaborative robots, have also been fairly small. If they hit you, the injury is not very great. But when you start getting into autonomous forklifts, excavators, or tractors, then you have machines that truly are big enough to kill you. We already see those machines automating. We are already starting to sign seven-figure deals to help them be safer. Many companies recognize the risk that is out there.

The machines that are biggest have obviously the greatest safety risk. Both the opportunity and the challenge in this industry from a safety perspective is that these risks are so new, there are no regulations yet to mitigate them. We do not even have well-recognized, well-understood practices that could be written into regulation. We are trying to invent the best practices for dealing with safety for autonomous systems. Once we do that. and the practices get accepted by the industry, which we're on our way to doing, then these could be written into regulation. But we're still a few steps away from stability in the appreciation of safety in this kind of world.

You look at something like aerospace, and the Boeing 787 or 737 Max aside, – let's take that as an exception because it was a bit of an exception – those safety practices are well understood. Car safety practices are well understood. The design principles, the regulation, the oversight principles, the certification principles – they are all very understood. Even in industries like pharmaceuticals and medical devices, these practices are stable and understood.

Smart machines are a space where you have massive change, and the regulations have not yet caught up. The best practices have not yet caught up. That represents a huge risk. If you're not reading about autonomous excavators killing children in the school yard yet, that is because the industry has not yet scaled to massive numbers of machines without a solid approach to safety.

If the industry scales too fast, without having figured that out, then statistically, you're going to see a lot more injuries that will halt the progress. That's a major risk.

In addition to the safety risks we have described above, we should put a coda on the security risk. The security risk applies to every connected machine that has any operation in the physical world. In any operation whatsoever, there's a way for a smart machine to cause trouble. Any connected device or machine is exposed to cyber attack. The IOT security industry is not nearly as mature as the IT security industry. That should scare everybody a lot, but we should not let fear paralyze us. Progress will depend on how well we overcome the fear. ■

About

Samuel Reeves is the CEO of Fort Robotics, an automation company that builds and operates smart machines safely and securely. Prior to joining Fort Robotics, Reeves served as Co-Founder and President of Humanistic Robotics, a technology company that addressed landmine & IED clearance using robots. He received his B.S. in Economics with concentrations in Finance and Management from the Wharton School of the University of Pennsylvania.

A Justice-Based Framework For Web3 Venture Investments

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The venture-backed pathway to prosperity has revolutionized industries, generated massive wealth, and created countless opportunities for global talent to thrive. But despite their seemingly unrivaled role in fueling positive world changes, venture investments have yet to capitalize fully on a tremendous opportunity to create meaningful social and economic justice. Widening wealth gaps, worsening climate disruption, lack of diversity in leadership, and unethical mega-corporation practices underscore the timeliness of the moment. For a venture industry that has focused so successfully on facilitating innovations of historic proportions, the emergence of ESG and socially responsible investing marks only the beginning of what's possible.

Today, the Web3 revolution has further heightened the stakes of justice. Proponents of a blockchain-connected world, echoing the optimism of the dot.com-batty evangelists of twenty-five years ago, have claimed that Web3's transparency and decentralization may indeed lead to a future of reclaiming individual rights and egalitarianism. We share their excitement, and we're eager to see how decentralized projects might lead to new solutions for seemingly intractable problems and injustices. At the same time, we know that Web3 – like innovations before it– is susceptible to many of the same risks that played out with Web1 and Web2, as well as some novel ones. Indeed, the recent collapse of some of the crypto industry's biggest and most trusted players has only deepened Web3 skepticism, not to mention scrutiny from regulators.

In the long run, we believe that the best Web3 ventures will defy the skeptics and prove the technology's full potential. But an individual project's success is far from guaranteed. Without an intentional justice-first approach to innovation by both investors and innovators alike, we fear that a naive optimism around Web3's structural egalitarianism will unintentionally culminate in a ➔

> **"In the long run, we believe that the best Web3 ventures will defy the skeptics and prove the technology's full potential. But an individual project's success is far from guaranteed"**

wave of insurmountable injustices that could eclipse the significant problems we already face today.

In light of these heightened stakes, we propose that the venture industry and founder community can each derive benefit from a new and collaborative justice-driven framework that can facilitate the change to which many investors and founders are already personally committed. This framework can become a shared headspace for the two groups– investors and founders– to come together to create lasting economic and social value.

We thus propose three core elements that should serve as north stars for a new collaboration between justice-driven innovators and investors looking to create both justice and profit in the Web3 world. As we explain, these elements leverage the convergence of business and justice in traditional areas that touch product-market fit, market-sizing, team-building, and strategic partnerships.

The core elements for justice-based collaborations are: (1) select an endeavor that seeks to remedy a massive unjust or unethical shifting of value, while maintaining a venture-justified business model, (2) leverage the blockchain to recruit a highly motivated and distributed group of part-time experts, including DAO contributors, and (3) situate each ambitious effort within a trustworthy enforcement or accountability system that provides powerful justice-based leverage.

> **We thus propose three core elements that should serve as north stars for a new collaboration between justice-driven innovators and investors looking to create both justice and profit in the Web3 world**

1. Remedy A Massive Injustice or Unethical Shifting of Value

Even if Web3 is able to maintain its independence from entities that seek to consolidate ownership and strip the blockchain future of its egalitarian hopes, corporate harms perpetuated over the past decades will be insufficiently remedied. It is indeed naive to think that decades-old harms of corporate fraud, environmental contamination, labor exploitation, and consumer deception will willingly slow down on their own and disappear in the face of more equitable Web3 forces. At best, even with a remarkably strong Web3 that becomes incorruptible, we estimate that trillions of dollars captured over the past decades through unethical or illegal means are being deployed in search of further profits and with little fear of consequences. And while we are steadfastly supportive of innovation leading to significant profit, one must draw a clear moral line when the future is uncertain and fragile.

Thus, real justice in the Web3 era provides an opportunity to strategically (and profitably) confront past wrongs with creative business models aimed at realigning resources equitably in a new kind of effort that leverages all that blockchain has to offer. Remedying environmental harms and consumer fraud stand as clear examples of areas in need of strategic intervention. In both cases, firms causing harm have– and continue to– employ economic analyses that balance expected profits against the (low) risk of being caught, qualified by the often small magnitude of economic loss that detection brings. Unfortunately, public, private, and nonprofit sector efforts at halting such unethical choices have failed, raising the question of whether Web3 can provide the tools to respond to such a systemic illness (and, as we discuss, whether such efforts can bring meaningful return on investment).

In our proposed world of venture-backed Web3 justice, then, it is crucial to identify a particular type of injustice that not only is large enough to create a material return on investment when addressed properly, but also one that does so without eviscerating meaningful economic justice to any and all victims. Thus, not all justice-driven Web3 forays become a worthwhile venture-supported fight.

We propose that new firms must find the perfect balance when selecting a powerful injustice to remedy, and do so in a way that meets the needed financial elements of three parties: the venture investor, a justice-focused audience, and the victims themselves.

To ensure that each such endeavor surpasses the required minimum standards, we propose confirming:

- Does the justice-backed monetization model indicate a fundamentally sustainable enterprise? For example, is there enough cash flow to allow the entity to continue pursuing social justice post-investment?
- Second, will the new venture deliver a reasonable return to investors and justify the investment? If not, the venture will be unable to meet its mandate and the venture should consider alternate funding sources.
- And third, and perhaps most importantly, will the justice-focused business model result in a meaningful shift in resources and provide victim-centered redress for those harmed?

At their core, these questions essentialize a type of market-sizing analysis conducted at most venture-backed companies. But we suggest that the market sizing of justice should not only follow both the traditional bottom-up and top-down best practices, but also that it must incorporate an additional element: how much justice will it actually create for previously harmed citizens, and how do we quantify the economic and social impact?

Once a new enterprise has selected a business focus that will result in a massive, ethical shifting of resources, constructed a business model that will satisfy the elements of our test, and verified both financial and real-world impact through the use of modified market-sizing, it becomes time to move to the next north star, the one focused on the team.

2. Leveraging the Idle Capacity of Motivated, Part-Time, Distributed Experts

The typical approach to leadership in the entrepreneurship literature would perhaps never embrace a quick turn to non-founding, non-employee, part-time outsiders to make the most tangible impacts on a start-up. And of course, we concur with the notion that a founding team's entrepreneurial passion is a meaningful predictor of success. But in the Web3 justice context, we are necessarily talking about leveraging a different kind of leadership model than the kind that can be generated by focusing on a core team alone; we are talking about talented global contributors with existing careers and expertise who become the passionate, dedicated, and impactful justice army.

As each of us make our way through our professional lives, only a limited number of justice-aligned professionals make the choice to pursue justice as a full-time career. Those who do tend to gravitate to the nonprofit sector or the foundation world. Stories of intrinsically motivated professionals turning into corporate worker bees, never to turn back, are easy to find. The private sector is indeed packed with righteous talent who often simply cannot afford to pursue their justice interests.

The exhausted corporate attorney, the lonely auditor, the organizationally constrained big-pharma scientist, or the job-insecure journalist all stand the chance to be invigorated by a justice-driven web3 world. But how?

This is where Decentralized Autonomous Organizations (DAOs) come in. Designed to leverage "on-chain" relationships, meaningful contributor participation and governance, as well as token-based compensation, these frameworks have the potential to be a game-changer not just for reorganizing a range of traditional organizations, but particularly for justice-based efforts. Building on section 1, in which we identified the importance of remedying a significant injustice while compensating victims, this section proposes that DAOs will provide the key human resource tool with which to leverage the talents and excitement of previously hibernating justice-driven contributors.

> **These frameworks have the potential to be a game-changer not just for reorganizing a range of traditional organizations, but particularly for justice-based efforts**

DAO governance

> **Built strategically, these outside, part-time, expertized teams will provide potentially unlimited scalability for the best organized justice-driven agendas**

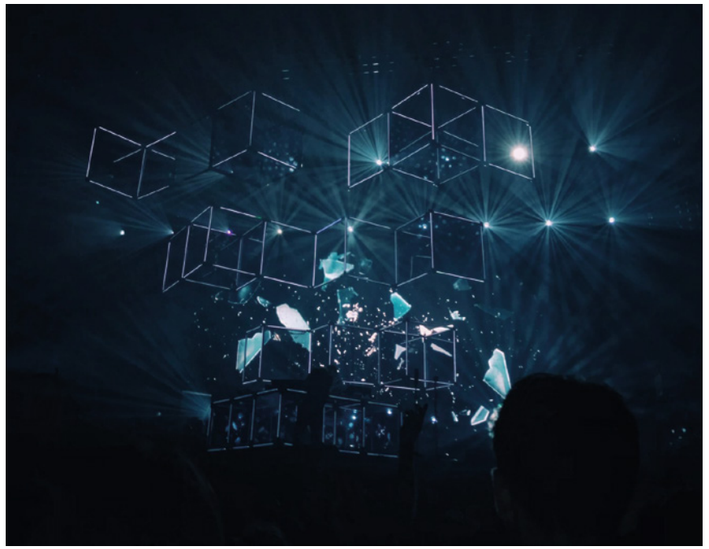
These contributors can and will likely fit multiple prongs of the following profile: They will (1) care deeply about the justice-based issue being addressed by the company, (2) have an expertise that gives them a particular skill set that can be leveraged, (3) have gainful employment that they are not necessarily looking to leave for the startup or non-profit world, and (4) seek fulfillment and community that are not being fully satisfied by their current career. Alerted to the potential of part-time, fairly compensated, cutting-edge justice work on an issue they care about, these people will readily join the effort.

Built strategically, these outside, part-time, expertized teams will provide potentially unlimited scalability for the best organized justice-driven agendas. Imagine chemists, surveyors, radiologists, accountants, lawyers, and more, lending their talents. Combined with the existing experts in building Web3, DAO members will serve to connect Web3 companies with justice that can and must occur off the blockchain.

Consider, for example, a new venture that seeks to reverse the course of toxic forever chemicals through strategic efforts. The new entity can leverage a partially decentralized DAO structure to enlist relevant subject matter experts including: chemical engineers, surveyors, satellite experts, chemists, water and soil sample gatherers, forensic scientists, nurses and medical technicians, and on and on. Although there will be a visionary and centralized leadership team at the company level driving the overall effort, thus situating the DAO in the category of a partially or progressively decentralized DAO, the DAO team will be a partially autonomous group responding to every need, fulfilling key tasks, voting and governing as needed, and adjusting on the fly to accomplish tasks.

Imagine that the effort is one to hold chemical creators and manufacturers financially responsible for the harms they created over a period of decades. In this context, separate DAO teams could: (1) work to understand the scientific scope and scale of a historical or present-day chemical manufacture or distribution, (2) perform a sort of public forensic-style audit of a company's financial or other disclosures, (3) assess the impact of human harms never before studied, and (4) prove a causal connection between a compound and a human, animal, or environmental impact. Few of these things would be possible, with such swiftness and scale, in a traditional organization, and perhaps none would be possible in a traditional startup environment.

With the idea validated and tested, and a scalable and partially-decentralized team ready to go, it may seem that this justice-focused company is ready to launch. Yet, there is a huge David versus Goliath problem: without some structural help, David probably cannot win a battle over unethically allocated resources.



3. Leverage Through a Reliable Accountability System

Taking on multi-billion dollar enterprises that have chosen repeatedly to transgress, even when a venture is armed with an impactful value shifting model, a morally driven team of founders, and expert DAO contributors, is still unlikely to be enough to flip the script on decades of ethically questionable yet highly profitable tactics. Unethical corporate entities will continue to be under-deterred. Thus, in order for even the most visionary justice-driven Web3 entities to have a meaningful chance at providing a generational shift in impact, these ventures must strategically tap into existing legal, administrative, international, or societal structures that provide the moral authority and rules-based organizational leverage needed. This leverage will serve as a heavy anchor and provide the chance for a justice-focused startup to make it over the top without being toppled by resource-flush resisters.

> “Outside of the legal system, other accountability systems can provide meaningful anchors for new ventures”

Depending on the domain in which the justice-based work is centered, being able to rely on a shared set of rules, expectations, or laws can serve an adjudicatory function, a way to enforce resolution of an inequality, with teeth. It can also provide access to a leadership or governing structure to ensure that a just redistribution of wealth occurs once an injustice is revealed and detailed. For example, the legal system can serve as an anchor for all justice efforts that wish to tap into the civil litigation system to hold entities accountable for harmful practices. Our forever chemical example above is relevant here, in that one important result of that work would be high-impact strategic litigation. A battle between a startup and a massive defendant certainly doesn’t guarantee a win within the legal system, but nonetheless law’s rules and fairness-driven norms can anchor such strategic efforts while providing the potential of meaningful recovery for true victims.

Outside of the legal system, other accountability systems can provide meaningful anchors for new ventures. Treaties, the United Nations, international laws, arbitrative bodies (domestic and global), village or local councils, private entities like the World Bank with their own enforcement powers, nationally adopted auditing and accounting rules and procedures, and even ESG rules and organized consumer-driven pushback are all possible venues that can serve to amplify the impact of David v. Goliath battles.

Conclusion

With these tools at hand, ventures need not rest their hopes of transformational change on Web3’s decentralization and on-chain transparency alone. Rather, leveraging an impactful resource-shifting mission with a business model, a strong decentralized team of experts, along with adjudicatory leverage, Web3 ventures can begin to unwind decades of injustice, all while providing meaningful return to investors. Without these elements, Web3 may simply end up providing just a new set of rerouted pathways that reward centralized power-brokers at the expense of talent.

Recent economic lessons, including the swift realignment of early-stage venture money, underscore the importance of following this model. Venture funds pumped the brakes on investment pipelines, switching their focus from dealmaking to slowing portfolio companies’ cash burn. DAO innovators began complaining about untenable structures and disengaged contributors, all while the expected economic independence of crypto began to falter as Bitcoin, Ethereum, and others seemed to fall, rise, and fall again with equity markets. Echoing our concerns, the talk of Web3 as a global justice conduit began to fade away, replaced by conversations that mimicked more traditional economic and investment discourse.

Though instability remains as we look toward the future of venture creation, as the dust of the latest realigning of the crypto industry begins to settle, a new horizon is emerging, one in which the promises of wealth, power-sharing, and even justice remain, but are situated within a risky environment that requires greater intentionality and precision to actualize on all three elements of the crypto triple threat. This Article has amplified the importance of, and opportunities around, maintaining a meaningful and lasting justice focus in the Web3 world, and proposed that investors and founders can follow a thoughtful, focused approach that can begin to make a true justice-based impact, globally. ■

About

Justin D. Levinson is a Professor of Law at the University of Hawai`i William S. Richardson School of Law and Founder of JUSTus DAO, a justice-focused startup devoted to transparency and corporate accountability. A former corporate attorney at Palo Alto’s Wilson Sonsini Goodrich & Rosati, Levinson has held visiting academic appointments at Beijing University, UC Berkeley, Nagoya University, and Tel Aviv University, where he regularly teaches a Global MBA seminar on Legal Aspects of Entrepreneurship. His research focuses on racial and gender bias in decision-making, and is cited widely, including by the United States Supreme Court.

Tim Young is a co-founder at Eniac Ventures with two exits as an entrepreneur and over 20 years of experience advising and investing in 100+ early stage startups. Tim has been fascinated by technology since his mother taught him to code in Fortran at the age of 10. He went on to study engineering and become a patent attorney and tech entrepreneur. In addition to his work as a VC, Tim is an adjunct professor at the University of Hawai`i at Mānoa’s William S. Richardson School of Law, and he’s passionate about helping to grow the region’s tech sector.

The Data-Driven Way to Measure Growth (and Win Customers' Hearts)

Neil Hoyne
Chief Measurement Strategist Officer & Global Head of Customer Analytics, Google

Many books about digital marketing are short-term and transaction-focused. They look for immediate ROI. In his book *Converted: The Data-Driven Way to Win Customers' Hearts*, Neil Hoyne argues that such short-term thinking is wrong. Hoyne has written it in his personal capacity; as such, it reflects his own opinions and independent research. He advocates building long-term relationships with customers. "Long-term thinking is not only a better and more successful way to approach customer relationships, it's also more profitable, and the data supports it," Hoyne says. A shorter version of this conversation was published in May in AI Business. What appears below is a more comprehensive version of Hoyne's conversation with the *Coller Venture Review*.

Coller Venture Review —

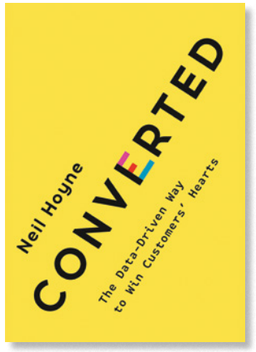
What inspired you to write Converted? Did you see any limitations in existing books about digital marketing? What gap were you trying to fill?

Neil Hoyne —

The first limitation in existing books about digital marketing is simply that they are short-term and transaction-focused. They look for immediate ROI. This is the single argument that carries forward in my entire book, which is that short-term thinking is wrong, that you want to build relationships with your customers. Long-term thinking is not only a better and more successful way to approach customer relationships, it's also more profitable, and the data supports it.

My second goal, which focused on the medium of a book as a whole, was to reach more people. In my role, I talk to the 16,000 largest advertisers, but generally these are companies that are spending at least $5 million to $6 million a year with Google. That's a lot of money. But these lessons and ideas apply to companies that are much smaller. My objective is to offer those cutting-edge best practices in a simple and intuitive way to the small businesses that may not have the resources or the marketing spend that larger organizations do, but they are still looking at opportunities for how they can grow and compete.

My third goal was just the accessibility of data to everyday business people, to everyday stakeholders. This was my attempt to say, "I want to bring everybody into the conversation to show that data can not only be interesting, it can be accessible. And so my third challenge was, could I write something that makes data interesting, intuitive, and accessible for more audiences. And those are the three goals."



CVR —

Many brands seem to believe that the solution to their problems lies in a four letter word, "data." But having more data, as you point out in your book, does not necessarily mean that it will be used well. Do you agree?

Hoyne —

As it relates to capturing data, I think that companies put a disproportionate amount of emphasis on collecting data, and the systems that support that collection. Companies seem to believe that data is the new oil, and therefore the more they can capture it, eventually they will be able to convert it into some type of value. That leads to a dramatic underinvestment in the second part of the equation, which is naturally, what do we do with all this data? Most leaders are not necessarily taking a step back and saying, what is it that you're hoping to get out of that data? What are those questions you're trying to answer? When we're talking about this within the context of the book is how you apply that data, and the questions that are important to ask.

CVR —

How can companies learn to use the data better to convert casual browsers into long-term customers?

> **Short-term thinking is wrong, instead, you want to build relationships with your customers. Long-term thinking is not only a better and more successful way to approach customer relationships, it's also more profitable, and the data supports it**

Hoyne —

Two things are worth mentioning. First, the idea of converting casual browsers – non-loyal or low-value customers into high-value customers – may be a difficult premise. In the real world, it would be similar to your meeting a friend who says, "I met this person, they're terrible for me, but I can change them once they see how good I am."

It's the same premise with many companies. It's a lot easier just to acquire great customers overall instead of trying to change or convert those customers. What I'm talking about here is to use the data that you're capturing not necessarily to convert casual customers into great customers and great relationships, but to use that data to go back to the beginning to say, how do I find these people that are great for my business? How do I find people that already have that natural fit? Where else can I go? What else can I find, and what do those people look like?

The second component, though, is to say not only are you using data to understand where those high-value customers are, and how to acquire more of them, you're also saying, how do I use that data to look inside myself and to become a better company, to offer things more for those high-value customers so that the fit and the attractiveness is already there.

CVR —

As more brands invest in AI and analytics solutions, how is this changing the kind of insights they can capture about their customers?

Hoyne —

Now, this is interesting because in my experience a lot of companies that are pursuing AI are being driven more with the attitude, "We need this tool," rather than, "We have this business question." They're so worried about falling behind in the race for AI and AI competency that they're not necessarily sure what they're supposed to pursue.

> **Companies seem to believe that data is the new oil, and therefore the more they can capture it, eventually they will be able to convert it into some type of value**

It seems like an afterthought.

Then you go back to those people and you ask, "What are you trying to solve with AI?" And they give you blank stares. It's like, "Well no, no, no, we're investing, it's just a capability our business needs" without really thinking of what the end goal is. Now, for those companies that are using it, and they're often using it carefully, they're going back to really what the essence of analytics and AI is supposed to be. So they already have their question in their mind, what are our high-value customers doing that we're missing?

The other component of AI which is fascinating is that they're using it to build a scalable process. The only way to do that in a scalable way, given all the data and signals we're collecting, is artificial intelligence, machine learning, which is really to take over that human component of analyzing the data and saying, really what's going on here and can we do this in a repeatable, scalable way.

CVR —

Can you offer a few examples of brands that are doing this well? What can small companies with limited marketing budgets learn from larger organizations in this regard? Are there any experiments that they can try?

Hoyne —

Within large organizations, the general understanding that they have more data, more capabilities, more systems, larger marketing budgets. But what we miss is that they also have large, overwhelming bureaucracies where prioritizing a question, getting alignment and action on that question is often difficult.

Smaller, more entrepreneurial startups, well they're smaller, they're more nimble, everyone is kind of aligned – plus they don't have those strict bureaucratic silos. But they all have that same objective, which means we need to succeed and grow as a company, otherwise somebody is going to be pulling the plug. What both recognize is that it's really the strategy by which you want to apply that data that allows you to compete.

Now, are there any experiments that I can try? What I generally advise is for companies to try calculating lifetime value. For a small, medium sized business it's not to say "I don't have enough data." Maybe your several thousand customers are plenty. Your two years of data is just fine. For mobile gaming it can be as little as a month's worth of data.

CVR —

How can brands become better at using AI for mass personalization at scale?

Hoyne —

There are a few points here. When we really talk about personalization we have to broaden our lens a little bit to say, "what do we know about these customers and what are their actual needs? How do we deliver them"?

Here's just one small example, and I like to use travel companies, for instance. Oftentimes they'll underinvest in that personalization to improve the customer experience, because in their mind it doesn't immediately lead to anymore incremental reservations. But if they took a step back and they said, let's look at the lifetime value, for instance, of customers that we service well, that we provide ancillary benefits to, they'd probably see that those customers stick around longer and probably spend a little bit more money.

Another example in the travel space is simply — this is a case study one time with one of those airline apps. What they found was that the lifetime value of people with their app versus just web users was roughly the same. Because their mobile app, even though it had a permanent place on their device, wasn't adding anything incremental to the experience. All they were trying to do was say, I need your money now.

And when they started adding additional features to say, let's help you manage your reward points, let's help you manage your way around the airport, to manage your travel reservations, they weren't finding immediate bookings. In fact, they found that it actually distracted some people from booking again. At the same time though, they found that the customers were happier with the airline, that in the future they booked more, and that their lifetime value went up.

So when we talk about how brands can become better using AI for mass personalization, again, it comes to what's the objective? Is the objective for using AI and personalization to drive that short-term conversion, to drive the acceptance of your immediate proposal, or is it to build a longer-term relationship? Once we go into the latter question, then we see how much more room we have to work.

CVR —

Which industries are doing particularly well at using AI and analytics to build long-term relationships with their customers? What are they doing differently than industries that are doing less well?

Hoyne —

You know, this is probably taking the easy way out. They may argue with it, but the industries that are doing particularly well are the industries that are entirely dependent on long-term relationships from the start. So if you think about subscription-based businesses, it would be silly for Netflix or HBO to say, we're only looking at short-term revenue. For a telco company to say we're only looking at your first monthly bill, that would be ridiculous for them. They have to forecast out that relationship, they have to look at how that relationship will change over time.

> "Don't use the data that you capture to convert casual customers into great customers, but go back to the beginning and find people that are great for business"

The laggards in the group, just for completeness, are generally ones where there's a lot of time between transactions. So large-scale purchases, when we're thinking about things like automobiles, that's 10 years in between purchases. The idea of lifetime value isn't really there. Long-term relationships are nice, but there's no way to directly measure its impact so it becomes a little bit harder for them.

And also in that category, consumer packaged goods or CPG. In CPG, it's not because these long-term customers don't exist, it's because they just don't have the data for it. They're getting aggregate data from their retail channels to say, look, I'm not going to tell you Neil bought x numbers of your products, I'm just going to tell you how many thousands of units we sold. And in that case, the only real long-term relationships they're able to build are with the retail channel partners who are selling their products through to the end consumer. So you do see them starting to push a little bit into direct-to-consumer selling. It's not because I think they want to compete in those areas. But they just want a little bit of that data, because they feel just by understanding a small glimpse of their customers they can make better long-term relationship decisions.

CVR —

You've worked with thousands of companies on data-driven marketing projects involving AI and analytics. What are the most common mistakes you have seen them make? What advice do you generally offer to avoid those mistakes?

Hoyne —

Number one, the challenge is I don't think enough people know what the business objectives are that they're trying to solve. As I mentioned before, they start with technology. "We need to be in AI, we need to be in machine learning, we need to have a bigger data presence." They do not necessarily know what business questions they're trying to answer.

Now, there are other mistakes. For instance, companies are unsure as to what level of transparency they need. Do they need to understand how these models work, how this data works? Do they have biased data? You know, we talk about these transformational technologies like AI, one of the things we neglect to discuss is in transformative processes and strategies, there's often a significant reallocation of company resources. Data is never binary. That wiggle room sometimes is just enough to create organizational deadlock.

Those are just some of the mistakes that they make, and you'll notice that these are not on the technical side. It's not about how to build the models or the technology that should be used or who should own the technology. It's simply decision making from an organization to say, "how are you going to handle something new that may not necessarily be transparent but may be disruptive." And as a leader in your organization, how do you have those conversations and guide people through that process. ➔

CVR —

What can brands do to establish relationships of trust with their consumers and increase their comfort level in sharing their data? What questions should they be asking to identify their most profitable customers?

Hoyne —

So let's work with the first part of this question. Establishing trust with customers is an important part of collecting any type of data, and generally what comes out of it are three things. First, consumers are looking for *transparency*, e.g., what are you doing with my data, what are you capturing? They are also looking for *control*, e.g., "can I remove my consent to that data, limit, or correct the data you've collected?" And finally, they want to understand the *value*, e.g., "how is the information that I've given you going to somehow benefit me?" Or are you simply going to use data to know which customers you can charge more for, or follow me around the internet with ads?"

That's a framework that a lot of companies fail to realize. They think it's simply messages on trust, or on privacy, and it's just a little bit more nuanced than that. In fact, some research has even found that mentioning privacy text as it's currently done –" here's our privacy policy" – actually *reduces* purchase intent.

The goal of these efforts in building trust with your customers should simply be better than what your competitors are doing. Remember, this is an auction environment. You just need to have slightly more data, slightly more trust, slightly better understanding of your customers than your competitors do. That should allow you to make better decisions and build better models. That's just one way to look at it. You don't have to be perfect, just better. Right now the bar seems to be fairly low.

> "The industries that are doing particularly well are the industries that are entirely dependent on long-term relationships from the start"

CVR —

What are the main takeaways of the book for entrepreneurs, venture capitalists, and private equity investors?

Hoyne —

Well, I would hope for entrepreneurs, much like marketers, that they take away a sense of confidence that these techniques can be a part of their portfolio, even with their current capabilities, even with their current set of data. And that they start to recognize unique advantages that they have in developing their team and developing their processes.

A lot of the third section of the book, self-improvement, talks about incremental change, experimentation, and making sure that you can actually act on the data. And my hope would be that entrepreneurs who read this early on will embed that as part of their culture and their processes, because they'll certainly have an easier time than a large company that's trying to change theirs.

Now, for the venture capitalists and the private equity investors, this would be related to how you really judge the performance and the effectiveness of the businesses that you're investing in. Who are your most valuable customers? Who are your least valuable customers?

There is also this emerging area where instead of looking at the individual customers, we take all the customers of the business, all of their lifetime values collectively, and add them up. We get a number called customer equity, which is how much your entire customer base is worth. This is the most valuable asset of your business – and we're able to put a value on it to say "this is how much they're going to spend." It allows you to better understand the valuation of the firm. Directionally it allows them to measure the full impact of what the teams are doing instead of just setting arbitrary short term metrics.

CVR —

If the CEOs of brands in the U.S., Europe, or Asia were to ask you where they should start to apply the lessons of your book and make smarter use of AI and analytics to build customer lifetime value, what would I recommend they do?

Hoyne —

Well, step number one is just to acknowledge that you probably don't need to buy more big data systems. You have all the data you have. Step two is to calculate lifetime value. The techniques are already available and proven, and you likely have data scientists already that can perfect the models if there are weaknesses. The third step though is actually making sure the right metric is front and center alongside all of your existing KPIs and metrics. And simply having that understanding, having that metric, even if you're not incentivizing people on it, even if you don't have a specific plan of action, encourages people to talk, to discuss, to understand how they change course. And then it comes full circle where the company starts seeking out more information.

CVR —

What new areas of research are you working on these days to build upon the foundation of the book?

Hoyne —

Well, there's a lot of different things in the book that I'm curious about. The application has infinite variations to go into – what are new techniques for acquiring customers, developing customers, retaining customers? And all of those are fascinating paths that could be their own guidebooks in themselves.

I am incredibly curious about how companies develop these assets and these people. I said early on that one of the things that I don't expect companies to do is invest more in software, because I don't think that's a solution. I think the solution is to invest more in people. But it's not simply hiring, it's being able to train and develop, and to understand those motivations, those incentives, those processes, how you build those functional teams. I think that's the next area of data science, because everything else by comparison is limited. ■

About

Neil Hoyne is Google's Chief Measurement Strategist and Global Head of Customer Analytics. His work on over 2,500 projects with the world's biggest advertisers has helped acquire millions of customers, boost conversion rates by over 400 percent, and generated billions in revenue. Hoyne's book, *Converted: The Data-Driven Way to Win Customers' Hearts* discusses how businesses can sharpen their long-term marketing strategy and create true value. Hoyne has written it in his personal capacity; as such, it reflects his own opinions and independent research. He received a Certificate of Management Excellence from the Harvard Business School, his MBA from the UCLA Anderson School of Management, and his Bachelor's degree in Marketing from Purdue University.

Virtual Roundtable
How Does a Nation of Startups Become a Nation of Scaleups?

Overview

Our *Virtual Roundtable* brings together global leaders and thinkers from Israel on the nation's growth from startup to scaleup.

In this discussion, we are joined by economists Uri Gabai and Eugene Kandel of the Startup Nation Policy Institute, who invite us to reflect on their views on education, inclusivity, bureaucracy, and the benefits of centralization.

Each of these individuals' perspectives, responding to what is both specific and general in the changing economic and social context, helps us to consider the profound ways in which the theory practice of new venture creation are informing one another. Looking forward, future discussions in the *Roundtable* section will continue to bring together partners and collaborators active in forging our new venture ecosystem.

From Startup to Scaleup

Uri Gabai
CEO, Startup Nation Policy Institute

Eugene Kandel
Chairman, Startup Nation Policy Institute

In this article with leading economists of the Startup Nation, we discuss the challenge of scaling from startups to scaleups. One thing is clear – whether it is increasing population-level benefits, helping to make government as adaptive as the startups themselves, or helping to ensure growth in the access to middle management, more centralization – perhaps even a National Innovation Council – seems likely to help with setting the agenda for continued growth.

Coller Venture Review —
Thank you gentleman for your time today. As trained economists, public policy leaders, and leaders of Startup Nation Policy Institute, you are clearly thinking across a broad range of topics and opportunities when it comes to innovation. Can we begin by your helping us to understand your mission please?

Eugene Kandel —
Our mission is about helping the Israeli government to be more proactive in the competition for ecosystems around the world – that is, government-to-government competition, rather than firm-to-firm competition. And we know that competition requires the government to be strategic, thinking long-term and having a coherent, coordinated policy. In general, governments in democratic regimes are pretty bad at strategy. Thus our goal is to help the government think in the context of a decade rather than for tomorrow morning. In doing so the government must first ensure that the Israeli tech ecosystem is in a leadership position worldwide ten years from now. Moreover, it must take steps to maximize the tangible benefits that the Israeli tech ecosystem provides to the average Israeli citizen in terms employment, investment, use of technology, and philanthropy. These benefits must become much more pronounced than they are today. Most of the work that we do is focused designing coordinated government policies that advance these two goals.

CVR —
In reading about the potential transition from "Start-Up Nation" to "Scale-Up Nation," where the tech ecosystem is presumably more fully integrated into everyday life, I've understood that some consider the challenge to be about a lack of middle management. Can you comment on this point of view?

Kandel —
I think that there is a perceived shortage of middle management for the simple reason that Israel has very few large corporates, and therefore relatively fewer trained corporate managers. However, I believe that there is no lack of ability among Israeli companies to scale. In the past, some people believed that Israel is only capable of building and selling startups, rather than growing companies. I am happy that this narrative has changed, and today selling a startup for $100 million is no longer considered to be a grand achievement. A different narrative, however, emerged, that in order to grow, you have to be near your clients or near your investors, which that in many cases causes Israeli companies to move most of their business activities abroad for growth stage. So it's really less having to do with middle management, and much more having to do with assumptions about how to achieve long-term sustainable growth. I would also add that there is in fact plenty of middle management available in Europe and the U.S., which one can hire and relocate – and many do. I do believe we have some shortage of experienced product managers. But then again, this is being solved, either by people rising to the challenge and moving across companies as they grow, and/or bringing in outside expertise. So bottom line, I don't think that the management issue, especially middle management issue is one of our top challenges.

CVR —
Thank you for a helpful lead-in! So, in fact, what would you gentlemen say are the top challenges ahead, when we think about extending the benefits and opportunities of an innovation-driven economy?

Uri Gabai —
First – expanding on what Eugene said – I think you have to look at this as an evolutionary process. You start from the very early stages of the state of Israel. You know, it was an economy that was decidedly not high tech, but it had lots of ideas – drip irrigation is a good example. The next stage was taking these (early) ideas and turning them into startups. That happened in the late 1980s and 1990s. And then you get the next stage – the ability to develop the product, not just have the technology.

And now, finally, the fourth stage – not just commercializing the product – but building a company with multiple products. And every time you advance to the next stage, you lack either financial components or human capital components. And you have to fill them in, as Eugene said, by either buying them or importing them. In my view, that's one of the advantages of a small economy. We have to remember, you will always have some elements missing in the growth of a very innovative ecosystem.

CVR —
Can you help our readers understand how these broad objectives are translated into action? How would you say you break the vision down into discrete priorities?

Gabai —
I think the first priority or the first objective must be making this journey. Going further, and I think Eugene talks a lot about this, is the importance of fighting complacency. It is our worst enemy. Japan was masterful in technology in the 1970s and 1980s, and we know they lost their ascendancy. And if it can happen in Japan – a technological giant and an economic giant – it can happen to Israel. If we go to sleep for five years, does it mean we miss the next stage? How do we think about pushing forward, towards the next innovation wave?

What am I looking at practically? Well, to start, I am looking at artificial intelligence [AI].

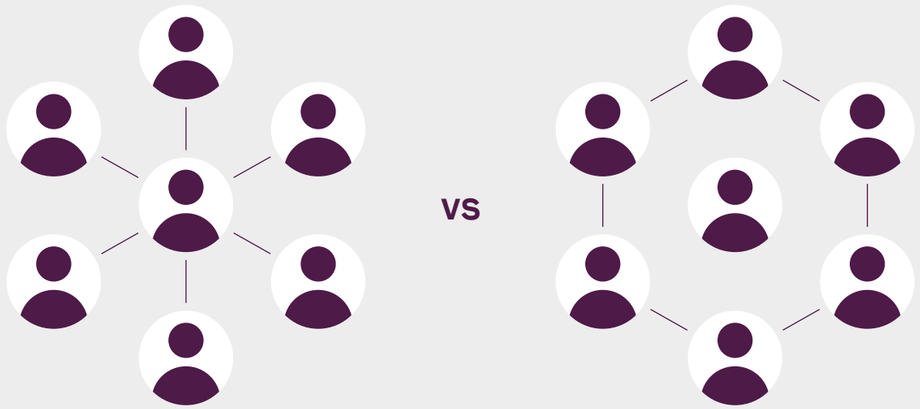
I think AI took a leap in 2013. It started in the 50s and 60s, probably before from a computer science point of view. But AI and big data really became an economic engine relatively recently. And when I think about this, I am mindful of that fact that China is also working on AI, and that their big data capabilities rely on a population of 1.3 billion people, multiple times Israel's population. So while I look at Israeli companies that are amongst the AI giants, and I think about a position of excellence, I say "Ok, we have to compete harder." And this takes planning, a point we keep returning to. Israel's innovation-related success today, it should be pointed out, started in 1973 and were redoubled in 1985 – the policies started years ahead of other nations, we had a head start. And this is a critical part of our nation strategy, and our national imperative.

To be clear, everybody understands that there is a global innovation race. No one is winning based on cheap labor anymore. So the competition is a lot fiercer, there are fewer arbitrage opportunities. It's also worth noting that it's no longer about national comparative advantage but about absolute advantage. Can we lose in this race? Yes, we can. But we don't have to. We just have to continue punching above our weight.

CVR —
What do you imagine is needed in order to do that, to continue as you said to "punch above your weight"?

Kandel —
Many of our companies compete quite well. But the government as a system does not compete well at all. For example, academia is set up structurally in such a way that it cannot compete for the top talent. The only way for Israel to win is by attracting the very top people in the world, or at least the top Israelis and Jews. Just to give you an example, Johns Hopkins University has a research budget of $3.5 billion/year. By contrast, the entire Israeli ecosystem research budget is $1 billion. In Israel, you have nine universities and 20 colleges, this budget has to be spread. How do you compete with somebody who can spend multiple times more than you can? Ultimately, you have to aggregate your resources, you have to focus on a small number of areas where you have a comparative advantage and which are critical for you. If you don't do that, and allow the system to spread thinly, you risk achieving very little.

> "And so that's our goal – to help the government think in the in the context of a decade rather than tomorrow morning"



CVR —
So, to paraphrase – it's really about bringing discipline and focus in order to play some smart bets?

Kandel —
Yes, exactly, and it's in every area, whether it's in training people, retaining the best companies, retaining the best people in academia and industry. There must be a coordinated effort that says, "We can't afford to lose this ecosystem. And if we don't compete head to head, we're going to lose." I am reminded here of competition between firms. Just as you know, the firm loses market share if it stops competing. Let us remember, Nokia in 2009 was the largest producers of cell phones in the world. And in 2013 it quit that business, since it was thrown out of the market after just three years, as it didn't look sufficiently strategically into the future. Israel cannot afford such experience. Back to the retention of talent, I will just point out that Israelis now make up 25% of the science-related faculties of the top 40 universities in the U.S. We need the top academic talent to come back, and we need it to stay. It's really about the balancing act of a rapidly growing and innovative ecosystem that Uri referred to earlier.

CVR —
How do you imagine a coordinated policy would address this challenge, and others like it?

Kandel —
The important part is not to find the very best answer, but not to end up with the wrong answer. To start, the biggest challenge is clearly that there is no cross-governmental forum with a mandate to get together and develop a common language, an agreed identification of challenges and opportunities, and then figure out a coordinated set of policies. This would also include identifying the tools that need to be developed and the amounts that need to be invested, as well as the type of regulations and laws that would need to be changed. Unless coming from the very top, I would say that such a forum is almost structurally impossible. So basically, we never optimize globally for the entire system – each office, each company optimizes within the constraints.

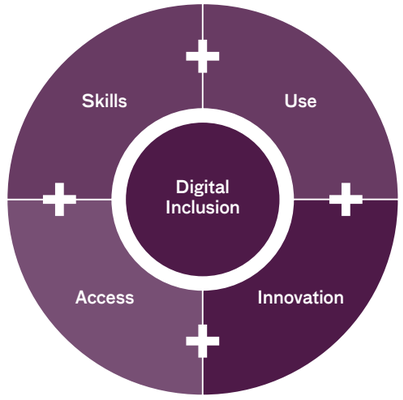
Gabai —
I totally agree. Now in the Office of the Chief Scientist, you have probably one of the most successful government organizations specifically in fostering innovation and R&D in history. But at some point, the challenge is to address the bigger puzzle. It's not just about R&D, it's a much broader challenge. So I see things slightly different than Eugene. I don't think it's just coordination. I think there should be an entity in government – a National Innovation Council let's call it – that is in charge of innovation policies, that synchronizes from blockchain regulation to financial services to security (as an example).

CVR —
How do you imagine this would affect the broader public?

Gabai —
Yes, that is the next challenge, getting more people and more diverse populations into innovation. You have to make the incentives right for the companies. And it's something that is not easy. But again it takes planning, and someone has to look at these challenges 10 years from now, and not as something for the next three months. You almost need a map of the world 10 years out, in order to figure out where to play, you really have to have a firm vision of where the world is going to go. And you really have to manage towards that future vision in order to draw out for people.

Someone in government has to look and say, "Well, these are the emerging technologies. Can I be a contender"? "Do I have the human capital to do this"? "What type of regulation will be required"?

> "I do believe we have some shortage of experienced product managers. But then again, this is being solved, either by people rising to the challenge and moving across companies as they grow, and/or bringing in outside expertise"



> For example, a lot of startups cannot grow here if they have anything to do with Bitcoin or any other virtual currency, they can't open a bank account. So that basically drives them to Cyprus or somewhere else, which doesn't make sense to us at all. But that, unfortunately, is one of these expressions of lack of coordination, cooperation, and guidance

CVR —
How does the bubble in valuations potentially affect the move to more scaleups?

Kandel —
Yes, there was a bubble in valuation. But I'm less worried about the big guys, I'm more worried about the small firms who are having tough time raising capital. Israel is generating fewer and fewer start-ups for the last 6 years now. So, if there is a certain convergence rate of start-ups that culminate in a unicorn, then fewer start-ups imply fewer unicorns in the future. These challenges are not getting enough attention from a policy perspective, specifically as it relates to regulation . For example, a start-up that is somehow involved with Bitcoin or another currency, finds it almost impossible to open a bank account, which drives them to Cyprus or elsewhere, which doesn't make sense to us at all. This is an unfortunate expression of lack of coordination and cooperation in overall policy.

CVR —
Where would you start, what first step would you take towards this more coordinated effort to support the growth of startups into scaleups?

Kandel —
The policy is not usually one big thing, as there is never a silver bullet. Instead, there's a series of things that together generate an environment in which something happens. It's very rare to create one large legislation or one large policy or regulatory change that would suddenly change everything. Thus we argue for the creation of some forum with a mandate and long-term view.

CVR —
Innovation policy is a serious business. Clearly it has to be driven by data. What are some of the challenges?

Gabai —
Once you take money from the government, then all of a sudden, one has to think twice about any advice being – same thing goes for Google or Facebook. But the goal is basically to build better foundations and give solid policy advice. Contextually, I think that the culture of science and knowledge and innovation was here from the get go. So, in that sense, I think that, we're part of a journey. And now there are new challenges ahead of us. You can't win with economies of scale. A small country like Israel can only win based on ideas. And what's high tech? High tech is basically taking these ideas and turning them into a product. That's the only way that we can win. And in that sense, you know, I'd like to think we are still in the very beginning part of the journey, on a continuum of growth we will manage.

Kandel —
I'm not there to win, I'm there to create ideas and solutions to problems that, in my opinion, are being neglected. For me, I might have done things that had a higher probability of success, but I didn't. I did things because I thought they were important. You always have to look at the bigger picture, the bigger story. ■

About

Uri Gabai is CEO of the Start-Up Nation Policy Institute. He was previously Chief Strategy Officer for the Israel Innovation Authority, where he headed the strategy and economics divisions. Gabai also previously headed the economic unit at Israel's Office of the Chief Scientist.

Eugene Kandel is Co-Chairman of the Start-Up Nation Policy Institute and former CEO of Start-up Nation Central. He is also an Emil Spyer Professor of Economics and Finance at the Hebrew University of Jerusalem, with a joint appointment at the Department of Economics and the Business School. His areas of expertise are Financial Markets and Institutions, as well as Corporate Governance. His work has been published in leading Economics, Finance and Accounting journals.

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Trends in Venture

From IoT in the Shipping Industry to the Management and Leadership of Change

Overview

Our *Trends in Venture* section addresses big picture changes when it comes to new venture creation, brought about both by technology and human leadership.

In an article from Abhay Kinra of Maersk, we learn how IoT is being introduced into the supply chain. From the academy, MIT's Daron Acemoglu summarizes the year of the "supply chain mess." And from Villanova University, Stephen J. Andriole and Noah P. Barsky help us consider the challenges of bringing innovation forth.

Together, these contributors help us consider new opportunities at an industry and enterprise level. Looking forward, future discussions in the *Trends in Venture* section will continue to link models of change across time, including the implementation of innovation based in technology and human practice.

Digitizing Trade – The Role of IoT in E2E Logistics

Abhay Kinra
Head of Asset and Cost Optimisation, Maersk

Today, there are many examples confirming that the shipping industry not only moves goods but creates competitive value for its customers through constant innovation of products and services. In fact, shipping companies have moved from a traditional ocean carriage to multimodal product offerings which also include a range of fulfillment services such as cold storage, packaging, and custom clearances – slowly capturing the entire end-to-end (E2E) value chain. The industry touches everything from moving bananas from Central America to the supermarkets in Europe – our clothes from Bangladesh to America, our COVID medicines from India to Africa, even to moving expensive yachts from China to France. Most companies in the Transport and Logistics sector (T&L) therefore compete at different legs of the transport and fulfilment services, and at several critical junctures in the market – at the nexus between transportation products and integrated solution offerings. For the A.P. Møller group in particular, the goal to become a global integrator of products and services is relevant for both long-term strategic customers and for the short-term market.

A.P. Møller Mærsk is part of a larger A.P. Møller group which also includes Danske Bank and Mærsk Tankers. The Mærsk name – synonymous with ocean shipping for decades – is a market leader in capacity and service offerings within the ocean space. At end of year 2022, the company's market capitalization was $265 Billion. Mærsk's strategy has been to build upon this foundation and offer integrated solutions for smooth and optimised cargo flows across all steps of the supply chain. In a nutshell, the company seeks to create value for customers in the form of better supply chain outcomes, increased transparency and control, and ultimately lower end-to-end costs. Notably, this 'Transformation" or "Integrator" strategy is unique in that it seeks to creates customers and financial synergies between ocean, landside, and air logistics. This in turn is meant to create physical assets connected to new digital platforms, an imperative powered by M&A in recent years and made feasible by steady cash flow, reported at $16 Billion in 2021, up from $4.6 Billion in 2020.

The transformation towards becoming an integrated transport and logistics company was launched in 2016. This so-called "integrator strategy" has included digital transformation, and

accelerated during the pandemic, which clearly upended the global supply chain. Within this volatile supply chain environment, logistics companies including Mærsk saw the benefits of Internet of Things (IoT) in mitigating some of the global supply chain challenges, including implementation in maritime setting; warehouse management; improvement in last mile delivery; and predictive analysis. Clearly, the company pivoted around next-gen technologies, big data, and innovation to transform into an end-to-end integrated logistics company. But what does this really mean, for Maersk in particular, for the industry in general, and for supply chains globally at the most macro level? This is not a trivial question: As companies are slowly adopting more IoT devices across their value chain aiming to solve some real supply chain issues which impact customer delivery promises, the real task is to understand how to envision the end state of their ecosystem – essentially understanding where they want to play and how to win. Given that the rate of adoption and implementation has generally been slow given the heavy asset base, it is critical to lay down a clear path for digital adoption, as any wrong turn can set back an organization by several years.

Thus, while inertia in the logistics industry has always been a challenge to overcome when it comes to adoption of digital technology, there is a clear digital imperative and a bright future ahead. A selection of critical advances in how innovation in IoT in particular is entering the shipping industry, is therefore summarized briefly below.

The Role of IoT to Date

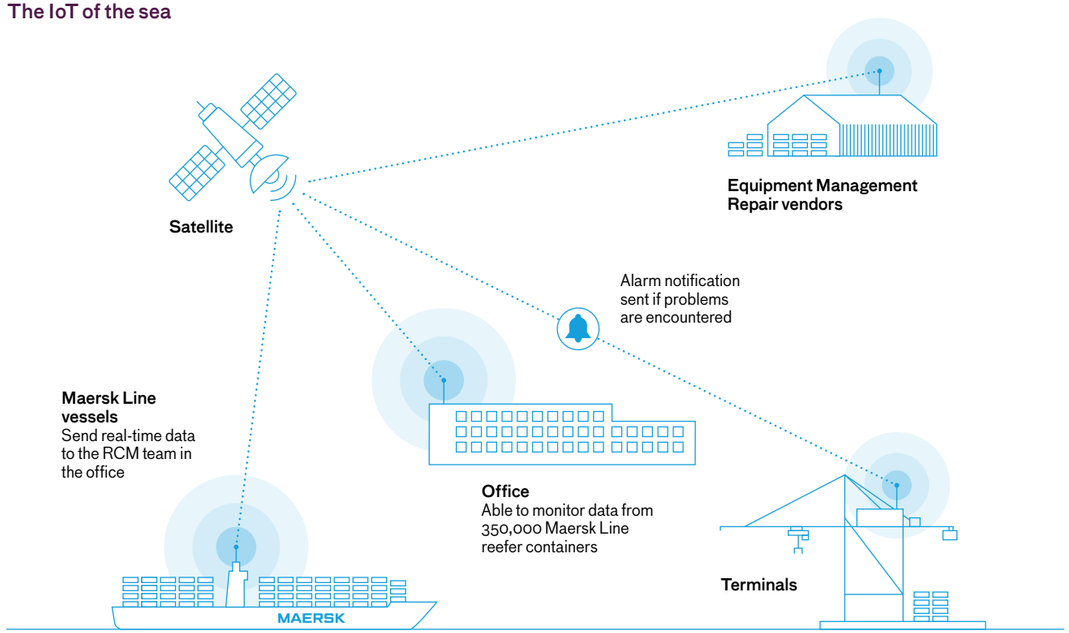
Services, tools, platform, and strategy are of course rooted in providing the best customer experience possible. This supports customers to focus on developing their core business. In an increasingly complex supply chain environment, this dependency – on a third party for logistics – can only come be successful via use of the digital solutions and harnessing the power of data analytics to support customers with the information they need to run their businesses.

Internet of things (IoT) forms an integral part of this digitization journey, connecting as it does assets and cargo, providing actionable information to support delivery promises. Most significantly, the suite of technology that enables IoT also enables new ways to differentiate products and services. Think about the following for example:

- **Fleet-Based IoT**
  The main scope of Fleet based IoT is centered around the container vessels. Fleet based IoT devices capture vessel data to optimize energy efficiency and support de-carbonization, crew safety, fire detection and machinery monitoring.
- **Cargo Monitoring -Based IoT**
  These solutions that provide containers with a 'voice' and the ability to inform employees and customers about exact location and status, with equal coverage both on land and at sea. Information is consolidated and made available via online tools to customers as well as to staff. The solution provides proactive information, making it possible to address potential complications in containers that could otherwise impact delivery plan and/or the cargo itself.
- **Vessel and Analytics -Based IoT**
  This includes vessel monitoring and performance management. In addition, solutions placed in terminals and depots enable data detection r elated to energy optimization, fault detection, and resolution support data.

> "Thus, while inertia in the logistics industry has always been a challenge to overcome when it comes to adoption of digital technology, there is a clear digital imperative and a bright future ahead"

The IoT of the sea



The role these type of IoT devices play is not limited to short term optimization. In fact, it allows for long term delivery promise enablement and creation of new business opportunities. Their impact can be seen in three critical areas –

- **Sensing and Monitoring**
  Capturing information across various aspects of supply chain, including monitoring environmental impact in the value chain. Naturally the highest concentration of IoT devices can be found here, as it is an area of direct control.
- **Adaptive control**
  Interpreting captured information and decision-making basis analytics, including orchestrating changes to the supply chain based again on environmental changes.

> "The role these type of IoT devices play is not limited to short term optimization. In fact, it allows for long term delivery promise enablement and creation of new business opportunities"

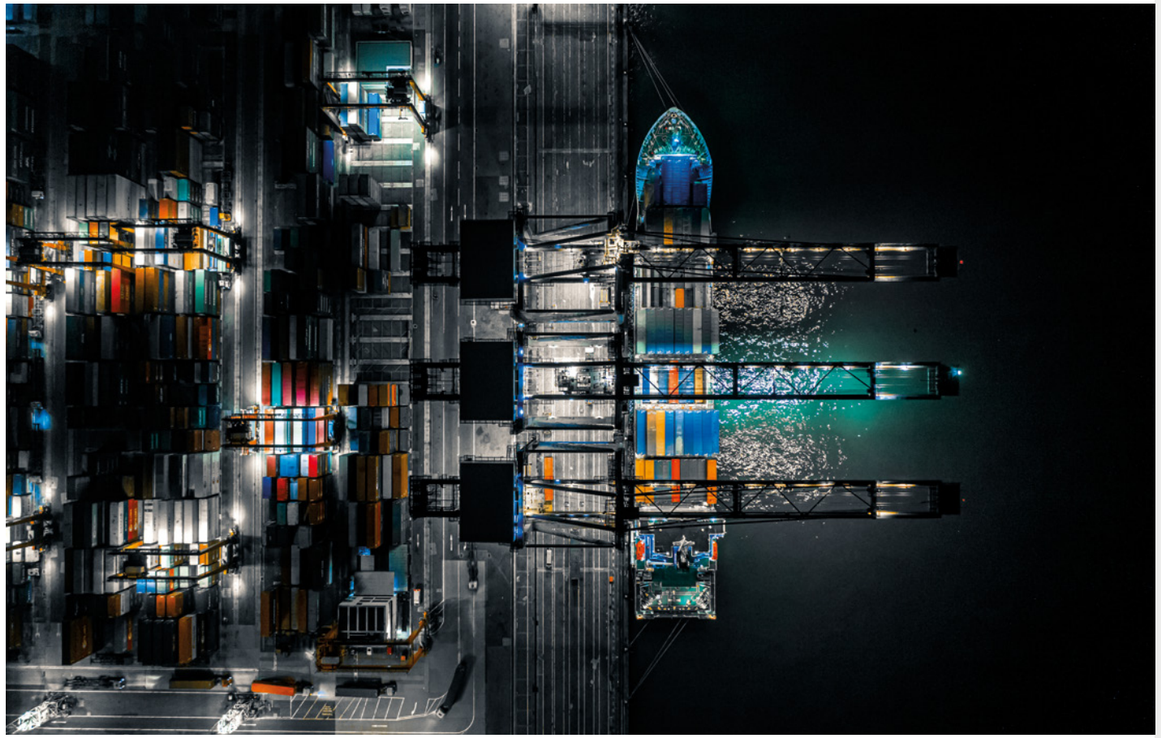
– **New Opportunities**
A broad category, that includes continuous improvements based on captured information, as well as ecosystem partnerships to enable wider market reach.

At Maersk, for example, remote sensor monitoring products like 'Captain Peter' bring transparency to customers of their perishable cargo. This includes real time data, covering temperature, humidity, location – from the time the cargo is stuffed until its discharged in its destination. In much less than the next decade – and despite the current challenges (some of which are described below), it is clear that IoT related to adaptive control and new opportunities will continue to be robust.

What comes next? – An IoT Ecosystem or Something Else?

Despite the advances and the opportunities, moving hastily towards an IoT ecosystem should not be the immediate next step. The real opportunity is on identifying bottlenecks that today limit the flow of information; are barriers in the value chain; and where the complexity is expected to grow as trade grows. The three steps below are therefore ones that the industry can take to reach the true potential of an IoT and digital ecosystem, one that removes the otherwise next generation of barriers:

– **Upgrading**
In the case of Maersk, one of the challenges the company faces comes from its strength. In other words, while the company continues to grow inorganically (based on M&A), its legacy systems are likely to fall behind the technology it inherits. This then suggests uplifting existing systems and associated processes. This transcends any one organization's boundaries. In fact, given the strategy of integrating E2E, it becomes crucial to ensure that a suppliers' internal systems and assets continue to interact in an optimal way with customers systems, which are naturally progressing at



> "Innovative IoT solutions require cross-industry partnerships.... creating industry wide standards for data and interfaces, interoperability of smart container solutions, digital improvements in operations to reduce wastage of resources, reduced greenhouse emissions, and documentation related to cybersecurity"

their own pace. Failing to deliver this could lead to missed opportunities to innovate new products, and even potentially lagging product quality and delivery times which might sneak in due to inefficient handshakes in the supply chain.

– **Standardizing to Scale Up**
In the integrator's vision and anticipation of covering E2E logistics, it is clear there is an imperative to work with partners and competitors. However, to provide a truly E2E product that is traceable and actionable through IoT, all the multiple legs of any given transport will be required to share the same framework, able to talk between different proprietary systems. Today, lack of standardization is one of the reason inefficiencies exist in the supply chain. IoT devices and associated frameworks are not immune to this challenge and will require standardization across the entire sphere of logistics. While it is clear that standardization will not benefit any one organization unduly but all equally (particularly in terms of reduced costs and improved service), the challenges to making this happen include conflicting priorities and inertia towards initial investment that could be sizable, including and extending to SME clients.

– **Moving away from Only Optimizing: Looking for Business Opportunities**
Maximizing the value generated through IoT applications means being able to identify and take advantage of new business models within the ecosystem. It is only possible by establishing a mechanism of continuous improvement, including reinvesting the captured information into new ways of generating value through the data captured from IoT devices. This in turn requires applications that not only include the company's operations but also integrate its customers into a product ecosystem. Maersk 'NEONAV' is one such tool created to support an entire supply chain and integrate a wide range of information from various sources enabling real time visibility, control, decision making. An application of this is the streamlining of the inventory management via data across multiple systems, creating a holistic view across all locations.

Across the above of potential "fixes," it is critical to recognize that the sector is quite hermetic, and far from being designed as open platforms for collaboration. Systems are disconnected with customers and are most often disconnected from other T&L service providers. To realize new business models and new revenues, supply- and demand-side systems need to work together to smoothly process information. This integration underscores the need for stronger partnerships and is an area that will require special attention. Innovative IoT solutions require cross-industry partnerships, and the success of any given initiative may depend heavily on the choice of partner and the values on which the company competes. An interesting

example of success, especially compelling given the context, is 'Tradelens' which is a cross-industry, cross-entities document sharing -platform that speeds up the workflow, brings visibility, and lowers costs.

Imagining Innovation and the Digital Future

IoT devices are not only enabling new business models and creating more revenue opportunities, but also feed into around decarbonization. In the case of Mærsk, the company in fact owns approximately eighteen percent of the world's global fleet, and therefore can contribute significantly towards decarbonization via efficiency management. Under fleet IoT devices, 'energy efficiency applications' serve the purpose of monitoring and optimizing the performance of the ships and supporting decarbonization journey. This includes, for example voyage simulator connected to various IoT devices onboard and at shore that provide the most fuel-efficient route for a ship to take in any weather condition.

Maersk also transports around 27% of worlds refrigerated containers and 25% of the world's food commodities. Through innovative supply chain products including cold chain solutions lies a wide spectrum of digital tech including IoT devices on refrigerated containers and in warehouses that contribute by providing real time info on condition of food, thereby supporting the organization's objective of halving food loss that occur during transit. In one recent example, Mærsk participated with Wageningen University and several customers to create a prediction model (a digital twin) to create and trial food quality related to data from container monitoring.

Despite these successes, inertia in the logistics industry has always been a challenge to overcome when it comes to adoption of digital technology. There is, however, a digital imperative and a bright future ahead. Despite volatility in global GDP, the extended impact from COVID 19, and rising trade tensions between states, top

> **"A continuous stream of investment will be needed to work on these global challenges and uplift the current digital landscape, remove legacy tools and systems, and develop a framework that can not support adoption of the IoT devices"**

shipping companies in 2010 formed an association (DCSA- Digital Container Shipping Association) to establish IT standards across the industry. Their purpose – facilitate digital connectivity and seamless data communication that anyone can leverage. This body is focusing on creating industry wide standards for data and interfaces, interoperability of smart container solutions, digital improvements in operations to reduce wastage of resources, reduced greenhouse emissions, and documentation related to cybersecurity.

It remains a challenge for Mærsk and other players in the sector to capture the values of integration, connectivity, decarbonization, and growth all together due to global disruptions that continue to undermine service delivery, and the lack of standardization, data, non-supportive policies, and partnerships that dampen the growth much needed to progress on these systemic opportunities. As an industry, we stand at crucial inflection point where decision needs to be made regarding future growth, collaboration, and partnership in the name of integration and sustainability.

A continuous stream of investment will be needed to work on these global challenges and uplift the current digital landscape, remove legacy tools and systems, and develop a framework that can not only support adoption of the IoT devices, but also allow the users to harness the data into meaningful insights to support growth for the customers, improve conditions of stakeholders in the value chain and support the sustainability agenda for society in general.

This decade seems to be the decade of action for many such initiatives and digitization and inclusion of technology in logistics might come across as an easy answer to many of the challenges, albeit one of the hard one to crack. ■

About

Abhay Kinra is a supply chain logistics professional with over 15 years of experience at Maersk. He draws on a range of previous experiences across multiple trade routes at sea; operations in Asia Pacific, and more recently in global container flow management in Copenhagen. Kinra currently heads asset and cost optimisation, where he brings otherwise conceptual innovations down to customer level. His passion also include bringing innovation to sustainability in an industry where small changes can have a huge impact. Kinra earned his MBA from the Copenhagen Business School with a focus on corporate sustainability and governance.

The Supply-Chain Mess

Daron Acemoglu
Professor of Economics at MIT

Recent bottlenecks and price surges have underscored the risks that come with sprawling global supply chains supposedly built around the principle of economic efficiency. But beyond these glaring issues, supply chains impose additional social costs that warrant policymakers' attention.

Global supply chains used to be the last thing policymakers worried about. The topic was largely the concern of academics, who studied the possible efficiency gains and potential risks associated with this aspect of globalization. Although Japan's Fukushima nuclear disaster in 2011 had demonstrated how supply-chain disruptions could impact the global economy, few anticipated how central the problem could become.

Not anymore. Today's supply-chain bottlenecks are creating shortages, propping up inflation, and preoccupying policymakers around the world.

US President Joe Biden's administration deserves credit for recognizing that supply chains are key to future economic security. In February 2021, Biden issued an executive order directing several federal agencies to secure and strengthen the American supply chain; and in June, the White House published a 100-day review on "Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-Based Growth."

This 250-page report contains many important proposals. Some are already part of the broader discussion on improving the US workforce's skills and the economy's capacity for innovation. Other ideas have been circulating for a while in international relations and security studies; for example, the document considers the national-security implications of defense and other critical industries' reliance on imported inputs.

But the review's most important contribution is its observation that global supply chains have imposed various social costs: "Our private sector and public policy approach to domestic production, which for years prioritized efficiency and low costs over security, sustainability and resilience, has resulted in supply chain risks." The review then asks whether hyper-globalized supply chains are so great for economic efficiency after all. ➔

> "Today's supply-chain bottlenecks are creating shortages, propping up inflation, and preoccupying policymakers around the world"

The default position among economists is "yes, they are." When two firms enter into a transaction in which each will gain something, that is good for both firms and also probably for the rest of the economy, owing to the resulting efficiency improvements and cost reductions. Whether this involves a US manufacturer offshoring the production of some inputs to a Chinese firm is beside the point.

Yet supply chains can pose a danger to an economy in two important ways (beyond the defense-related concerns mentioned above). The more complex a supply chain becomes, the greater the economic risks. A break in any link can affect the whole chain and send prices surging if it creates sudden shortages of a necessary input.

The worst-case scenario is when a failure in one part of the chain triggers domino effects, bringing down other firms and bringing the entire sector to a standstill. Logically, this scenario is similar to what one finds in financial networks, where the failure of one bank can push others into insolvency or even bankruptcy, as happened in 2008 following the collapse of Lehman Brothers.

In principle, because uncertainty is costly, businesses will take these risks into account when deciding to build supply chains. In practice, however, there are good economic reasons why firms may overextend their supply chains. For one thing, firms will account for their own risk, but not for the systemic effects they are creating, nor for the risks they are imposing on other firms or the entire economy.

Moreover, when global competition creates powerful incentives to reduce costs, even small price differences offered by foreign suppliers can become attractive, especially in the short term. In this age of stock-market options and hefty bonuses, financial interests also factor into managers' considerations. CEOs enjoy immediate compensation when they can achieve cost reductions and increase profits, whereas the significant costs of future uncertainty – or even bankruptcy – will likely be someone else's problem.

> **"The worst-case scenario is when a failure in one part of the chain triggers domino effects, bringing down other firms and bringing the entire sector to a standstill"**

A second way that companies may overextend their supply chain is subtler but no less important. The problem, the White House review notes, is that "the United States has taken certain features of global markets – especially the fear that companies and capital will flee to wherever wages, taxes and regulation are lowest – as inevitable." This statement echoes economist Dani Rodrik's prescient observation that globalization is not just about trade in goods and services; it is also about the sharing of rents. As such, the globalization of supply chains is an integral part of the shifting balance between capital and labor.

The most straightforward mechanism for this process is the offshoring of inputs, the mere threat of which can be used by managers to keep wages low. This happens on both ends of the offshoring transaction: US companies can pay less to their employees by expanding their supply chain to countries (such as China or Vietnam) where wages are already lower as a result of lax labor regulations.

A fragmented supply chain may also make it more difficult for workers to organize for collective bargaining, creating yet another benefit for businesses. Companies may even reap tax advantages from globalizing their supply chain, if doing so allows them to book profits in lower-tax jurisdictions.

This second reason is problematic for the US economy as well. It suggests that managers will tend to globalize their companies' supply chains even when doing so is not more efficient, simply because doing so allows them to shift rents away from workers and toward shareholders. Not only does this create an excessively overextended supply chain; it also distorts the income distribution by suppressing wages, especially for low- and middle-skill workers.

The White House report proposes keeping more of the supply chain in the US, especially in manufacturing. But how can this be achieved? A two-pronged approach would be the most effective. First, the need for meaningful inducements for businesses to invest in their domestic supply chains implies that the tax advantages of offshoring inputs should be eliminated, and the opportunities for labor-regulation arbitrage should be curtailed.

But other, more fundamental changes are also needed. The global supply-chain mess is an opportunity for the US to have a broader conversation about the economy and what it is for. As long as CEOs remain obsessed with short-term stock-market performance, bolstered by the ideology of "shareholder value," they will seek ways to shift rents away from their workers, whatever the risks. ■

About

Daron Acemoglu, Professor of Economics at MIT, is co-author (with James A. Robinson) of *Why Nations Fail: The Origins of Power, Prosperity and Poverty* (Profile, 2019) and *The Narrow Corridor: States, Societies, and the Fate of Liberty* (Penguin, 2020).

Innovation's Quiet Truth

Only the Brave Will Survive

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All ventures must innovate to remain competitive. However, the harsh reality is that most innovation initiatives fail despite massive investments in methodologies, organizational structures and human capital. Substantive innovation requires far more than inspirational quotes about change and irrelevance, aspirational task forces, dedicated funding and other forms of stagecraft. This paper synthesizes research on why innovation falters and how courageous leaders can try to fix it by disassembling its teams, structures and perhaps, over time, its culture.

Innovation Challenges

Innovation is not necessarily a mainstream function. Regardless of the industry, at its essence, it challenges orthodoxy, vested interests, misaligned incentives and entrenched workplace power bases. Not surprisingly, its failure is rooted in widespread human, organizational and workplace culture problems.

People problems include less than perfect innovation leadership capabilities: many executives and program/project managers have little or no innovation experience. Further, the very skills and competencies that advance careers and serve traditional functions well are ill-suited to innovation.

Functional experts often struggle when asked to adopt a broad business perspective, foresee market trends and formulate true strategic insights. Even with a clear and compelling vision and mission, execution frequently sputters as many leaders lack the deep process, technical or domain knowledge to innovate. Far worse, others bring "bad politics" that devolve innovation initiatives into battlegrounds for budgets, people and personal visibility.

The second set of problems are organizational. Traditional functional fiefdoms with chiefs, teams and resource constraints seldom achieve even incremental innovation. In response, new ventures fund, join, and publicize flashy labs, Centers of Excellence and corporate venture capital organizations to spur innovation. While increasingly popular, sadly, these efforts falter too, seldom yielding tangible accomplishments or positive ROI. Their demise is often attributed to rudderless leadership, poor talent fits and more urgent, competing resource requirements.

The last set of problems is anchored in culture. While many companies speak fondly about innovation, they often view it cautiously, at best, or even in some cases, almost resentfully. Innovators in these cultures are sometimes quickly ostracized as they challenge the status quo, further inhibiting others and thwarting change. As we explore here, culture is the diagnostic starting point for addressing innovation's barriers to lasting, meaningful change.

Innovation's talent, organizational and culture "importance-readiness gaps" afflict organizations, impair strategic agility, hinder competitiveness and drain financial resources. For innovation to thrive, each gap must be addressed with uncommon candor, decisive leadership and credible action.

Innovation Defined[1]

The Merriam-Webster Dictionary defines innovation as *"(1) the introduction of something new or (2) a new idea, method, or device: a novelty."* Yet, senior leaders are often unclear what they mean by business innovation.

Clayton Christensen (1997), in his seminal book, *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, distinguishes between two types of innovation: disruptive and sustaining technologies. Disruptive technologies are the "game changers," while sustaining ones modernize existing products, services and workflows. The latter are incremental, more common, less consequential and, of course, much less risky.

> **"Innovation is not a mainstream function. Regardless of the industry, at its essence, it challenges orthodoxy, vested interests, misaligned incentives and entrenched workplace power bases"**

Figure 1: Types & Targets of Innovation

Type	Product	Service	Process	Business Model
Disruptive Innovation	Innovation that Disrupts an Existing Product	Innovation that Disrupts an Existing Service	Innovation that Disrupts an Existing Process	Innovation that Disrupts an Existing Model
Modernization-Based Innovation	Innovation that Renews or Upgrades an Existing Product	Innovation that Renews or Upgrades an Existing Service	Innovation that Renews or Upgrades an Existing Process	Innovation that Renews or Upgrades an Existing Model
Incremental Innovation	Innovation Designed to Simply Tweak an Existing Product	Innovation Designed to Simply Tweak an Existing Service	Innovation Designed to Simply Tweak an Existing Process	Innovation Designed to Simply Tweak an Existing Model

Risk, Impact & Failure of Digital Innovation Projects ↑

For our purposes, we define innovation according to Figure 1. Note that there are three kinds of innovation: incremental, modernization-based and disruptive innovation. Note also that innovation occurs among products, services, business processes and entire business models. Most "innovation" is incremental. Incremental innovation, no matter how it may be sold to stakeholders, is barely innovation at all. Real competitive advantage is created by disruptive innovation, but many companies are far more comfortable pursing incremental innovation because – as Figure 1 suggests – it is much less risky than disruptive innovation and therefore less likely to consume lots of resources or threaten otherwise ascendant careers.

Innovation Talent

There are no perfect solutions to talent problems. Many people problems are intractable, but there are some steps companies can take to improve their innovation prospects. Perhaps step one is to just look in the mirror. Centers of Excellence, innovation labs and corporate venture capital organizations need the right people. Matching talent to needs requires candor and hard decisions.

Innovation skills and competencies include ideation, design thinking, scenario planning, stage-gating and strategy, among other areas that distinguish professionals from functions like finance, marketing and operations. If existing innovation talent falls short, then new talent must be acquired, which can be done by adding to the permanent staff or through outsourcing. Ahuja (2015) cites the success of "citizen hackers" who have a passionate curiosity, prioritize problem-solving and consider novel business models. In the *"5 Myths of Innovations,"* Birkinshaw, Bouquet and Baresoux (2011) conclude that *"making innovation everyone's job is intuitively appealing but very hard to achieve."* Managers can identify problems, but rarely move from ideation to commercialization, leading to frustration rather than motivation. ➲

> While many larger companies speak fondly about innovation, they often view it cautiously, at best, or even in some cases, almost resentfully

Barsky and Catanach (2011) advise leaders to elevate the workforce's business acumen to attempt to break this logjam. Do team members really understand core business processes and their relationship to competitive advantage through innovation? Do team members understand the business "outside in" from the perspective of customers, suppliers, competitors and financiers? Are there incentives to question the status quo, rewards for experimentation and accountability for business improvement? When expensive innovation projects go awry are the innovators in any way "punished" by leadership?

Despite anecdotes to the contrary, there are actually very few professionals with real innovation talent. The most talented ones reside in start-ups – and therein lies the problem for medium-sized or large entities. It's not a paucity of innovation talent – it's that many larger organizations cannot recruit and retain the "uncomfortable" talent that would rather be somewhere else. Innovation DNA is mismatched from the outset.

A common solution to this problem is the retraining or upskilling of employees to be more innovative. Upskilling is always challenging and not always appropriate (Freschi, 2020; Martinaitis, Christenko and Antanavivius (2020); Weber, 2021). Weber describes why up-skilling is so challenging:

- **Data:** Companies typically don't have a clear view of their own employees' talents. Few firms have repositories of data on a person's skills, internal reputation, learning capacity, ambitions and interests.
- **Speed:** Converting a mechanical engineer into an electrical engineer, or a business analyst into a data scientist doesn't necessarily happen in one quarter — or even a fiscal year — the cadences that shareholders understand.
- **Money:** Employers have long shown a reluctance to invest the dollars needed to successfully retrain large swaths of staff, even when the economy is strong.
- **Unrealistic expectations:** Society needs to recalibrate expectations for worker retraining. Laid-off coal miners probably won't become data scientists, and few AT&T line workers will morph into software developers as the company transitions from a telephone company to a wireless and services business.

The reason why professionals self-select into corporations is precisely because they believe their skills are more suited to corporate life than start-up chaos. Often, all the best big companies can do is to hire or rent innovation talent from the outside. Upskilling is too often ineffective and almost always expensive.

Innovation Structures

Companies that believe innovation should be a core competency often formalize their efforts in formal organizational structures such as innovation labs, Centers of Excellence and corporate venture capital teams. Sometimes they organize vertically where each major functional area or line of business pursue their own innovation projects. Regardless of whether the approach is centralized or federated, innovation initiatives need budgets, teams, processes and a slate of projects consistent with short-term and longer-term business objectives – none of which are easy to procure.

Gryszkiewicz, Toivonen and Lykourentzou (2016) define innovation labs according to their features:

1. Imposed but open-ended innovation themes
2. Preoccupation with large innovation challenges
3. Expectation of breakthrough solutions
4. Heterogeneous participants
5. Targeted collaboration
6. Long-term perspectives
7. Rich innovation toolbox
8. Applied orientation
9. Focus on experimentation
10. Application of systemic thinking

Unfortunately, and despite of thoughtful lists of features like these, innovation labs frequently fail (Cornelius, 2021). For example, Ahuja (2019) suggests that innovation labs fail because they lack alignment with the business, define and measure too few innovation metrics and assemble unbalanced talent teams. Khanna (2021) echoes many of the same reasons why innovation labs fail, including:

- Don't have a clear objective and success factors defined
- Don't have long term goals defined, broken down into clear quarterly
- Are not aligned to company goals
- Lack KPIs

> **Substantive innovation requires far more than inspirational quotes about change and irrelevance, aspirational task forces, dedicated funding and other forms of stagecraft**

According to Pemberton (2016), a Center of Excellence is:

"A physical or virtual center of knowledge concentrating existing expertise and resources in a discipline or capability to attain and sustain world-class performance and value … (that) need to focus on a tight scope defined around a specific capability such as marketing analytics or digital commerce … (and) pushing beyond standard performance norms to deliver incremental value to the organization."

COEs can be organized around internal talent and/or through partnerships with start-ups, universities and not-for-profits. The insourcing/outsourcing decision is critical to the success of COEs which, when insourced, often suffer from poor performance – as Speelmon (2022) and Evans (2016) describe. Speelmon suggests that COEs fail for these reasons:

– Lack of Strategy

– Insufficient Resources

– Poor Management

– Perceived Value

Evans (2016) sees other problems with COEs:

"At the heart of the challenge is a fundamental misunderstanding of who (or what) the COE is and the specific value it is expected to provide to the business. Ask the leaders of any COE to describe the mission of their respective COE and you will get a myriad of responses … the challenge is that each item listed requires different degrees of expertise, managing different processes, with different outcomes, each of which with different success metrics. As COEs try to be 'all things to all people.' the business is left wondering what overall value the COE is providing."

Corporate venture capital (CVC) organizations are another breed altogether. They look for ideas everywhere and invest in the ones they believe best align with the company's strategic direction, or even the ones most likely to redefine strategy. In many respects they behave like private equity venture capitalists, though unlike PEVCs, they spend their own money.

CVC organizations fail for several reasons (Teppo and Wüstenhagen, 2009; Wendt and Spaulding, 2019; Haslanger, Lehmann and Seitz, 2022). Some of them include incompatible corporate cultures, too much caution and the lack of patience. But perhaps most importantly, the failure to understand the essence of venture investing is the reason why CVCs fail (Wendt and Spaulding, 2019):

"Venture capital works best when it plays by a set of rules that are higher risk than most corporate executives are used to. VCs invest in innovations that are far from product-ready, and many fail to pan out —the price of developing unproven ideas. Corporate VC executives must be given latitude and permission to risk failure."

Traditional structures – labs, COEs and CVCs – fail because they are run by people with little or no innovation experience. They also fail because they immediately become entities of their own, succumbing to all of the "best practices" of traditional corporate structures. They're also politically pre-programmed with project slates developed by the same employees who fail to understand that innovation does not keep a schedule with planned stops.

One threat to innovation stands out from all the rest: corporate culture.

Research suggests that cultures are resistant until financial metrics suggest change is existential (Andriole, Cox and Khin, 2017). Innovation culture should be "sold" by innovation survivalists, not organizational survivors. Survivors have navigated corporate careers that dodged countless change initiatives. Worse, late in careers, as work horizons shorten and salaries peak, survivors have strong personal incentives to ➔

> In fairy tales and conference rooms, the mirror lies to appease the royal

resist and obstruct innovation. Corporate culture remains the most challenging threat to innovation because its relentless resistance to change.

Walker and Soule (2017) have some suggestions:

"Culture is like the wind. It is invisible, yet its effect can be seen and felt. When it is blowing in your direction it makes for smooth sailing. When it is blowing against you, everything is more difficult. For organizations seeking to become more adaptive and innovative, culture change is often the most challenging part of the transformation. But culture change can't be achieved through top-down mandate. It lives in the collective hearts and habits of people and their shared perception of 'how things are done around here.'"

Cultures can change when their existence is threatened (Andriole, Cox and Khin, 2017). Competitor analysis can spark change especially where rivals loom large. Banks and equity holders can exert pressure for financial returns. In those circumstances, innovation is easier to motivate. But does it need to reach that point? Yes, most cultures are bullet-proof until a gun is actually fired.

Leaders can address challenges to the long-term status quo. Questions address each aspect of the value chain, by focusing on market trends rather than internal benchmarks. Managers who thoroughly understand how business processes serve strategy and competitive position are ideally suited to innovate in ways that drives a culture that values such thinking. Are they easy to find? No, they are not, but the recognition of what companies need and the constant search for internal and external talent are necessary innovation steps. If this search stops or fails, the prospects for disruptive innovation weaken.

Conclusions

Leadership's next best step is a long, hard look in the mirror. In fairy tales and conference rooms, the mirror lies to appease the royal. Leaders seeking innovation must cut through the rhetoric and candidly assess their talent, structure and culture. In the unlikely event that solid talent and structures are in place, therefore, it reasons that culture remains the key barrier to change.

Calling on managers to display creativity and innovativeness is futile, if they do not truly understand the business, its competitive marketplace and emerging technologies. This line of inquiry raises questions about the strategic consequences of inaction. Such questions are often effective in reverse engineering a business from a desired strategic position and articulating the grim future of not doing so. That's the most honest look at the faces in the mirror a company can take. If what companies see is real, they can begin to pack up their innovation strategy and wish it well as it travels far, far away to innovate in peace.

Given all of the failure related to talent, structures and culture, perhaps it's time to face reality about the prospects for innovation. Companies can keep spending away at the problems or they can pursue a different path. Here are three recommendations likely to improve innovation at many companies:

- Admit that disruptive innovation is beyond the reach of corporate lifers. Admit that investments in re-tooling, coaching and up-skilling are unlikely to breathe innovation spirit into corporate survivors.
- Disassemble the expensive, under-performing internal innovation structures that have failed for so long.
- Outsource (and remove from "headquarters") labs, COEs and CVCs (or whatever they turn out to be) through partnerships with those who have successfully innovated in direct and adjacent domains.

And the culture juggernaut? The disassembling of internal innovation structures and the outsourcing of labs, COEs and CVCs can significantly end-run the effects of culture on the innovation mission. Over time, if corporate cultures show signs of real change, then perhaps companies can rethink their innovation strategies. In the meantime, companies might think about how to kill and then reincarnate innovation in a place far, far away. History shows that may be the best option. ■

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About

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V

Industry Analysis
Taking a Look at Africa's Billionaires, Innovation, and Impending Change

Overview

This analysis section draws on one of the most essential tools for analyzing a commercial ecosystem, and facilitates an understanding not just of what is, but what is becoming.

In this issue, David Grammig, of Grammig Advisory, gives us a birds-eye view of entrepreneurship and innovation in Africa, from the opportunities to the challenges posed by still-emerging frameworks for knowledge sharing, and for collaboration infrastructure and education.

Looking forward, this section in future issues will similarly be written by leaders addressing transformation in ecosystems that are generally less well understood, yet critically imbricated within our shared global context.

Innovation and New Ventures in Africa — The Road Ahead

David Grammig
Founder and Managing Director, Grammig Advisory

In this interview with the *Coller Venture Review*, David Grammig, Founder and Managing Director of Grammig Advisory, talks about the future of Africa, and how new venture is growing on the continent.

Coller Venture Review —
Hi David, thanks for taking the time to share your venture and inspiring vision. Let's start at the beginning. I understand that you help connect private investors in Africa. Can you explain?

David Grammig —
We create a network of family offices, part of a network that we intend to span the continent. It is the continent with the fastest growing population, and Africa is not only growing but leapfrogging. The opportunities are huge.

CVR —
Can you explain a bit when you say "opportunities" – how is this linked to funding and support for new ventures?

Grammig —
Great question. We are principally focused on three areas:

The first is Food Tech – broadly speaking, this means feeding the continent. We also see many opportunities in the Mobility sector. To us, this is not just about supporting mobility across a city (for example) but, more fundamentally, about connecting networks of people, across villages, to one another. Finally, we are focused on Energy. Again, we look downstream to impact. For us it's not just cool ideas, but the transformative potential of those ideas. In the energy sector, for example, this includes energy solutions so kids can study at night and even participate in home schooling.

What we are not is a gateway for foreigners to recolonize, which is an important point to make. Having said that, there is plenty of room for foreigners to participate. For example, we have a Swiss company active in Ghana, they work with Ghanaian cocoa farmers. They have a triple impact – environment, social, and health. They help farmers who earn less than a dollar a day, and I can say it is a true collaboration.

CVR —
Zooming out for a moment, you work across Europe and the Mediterranean as well. How would you compare innovation across these ecosystems?

Grammig —
I think it's the sense of innovation and the drive and the resourcefulness of the people – ideas that are really ingenious, that solves problems that are there. People on the ground are often the best problem solvers, and the people on the ground in Africa are really still very close to the problems they are trying to solve – and with relatively less resources. In my view, the relatively short distance between any given problem and the need for a solution is a real differentiator. As I said earlier, if we can't solve the energy problem, it's not that electricity might cost a bit more…it's that children can't get educated.

CVR —
Africa is a big continent, and it hard for those of us who haven't lived or worked there to really get a sense of the huge potential you've alluded to, beyond the specific areas of focus you've mentioned. Can you help further frame it?

Grammig —
Sure. Africa has 54 countries with 54 governments and endless numbers of political systems. Several are financially sophisticated and internationally connected – there is tremendous wealth in countries as far afield from one another as Rwanda, Egypt, Morocco, Nigeria, Kenya, South Africa, Tanzania, and even Zimbabwe. These countries and others have tremendous natural resources, and very highly educated people – but also sanctions and a political elite that has been grabbing onto power for way too long. So, in that sense, I would say it is both huge potential – and also of course huge challenges.

> **"Africa is still really protective. I think it's best summarized as 'Whatever I share with you, you will use against me to my disadvantage.' But this needs to change, so everyone can work together and expand."**

CVR —
Are you alluded to infrastructure challenges here?

Grammig —
Absolutely. There are huge struggles with infrastructure and connectivity. A family that attended my conference had to travel 24 hours…air travel is a big hindrance to trade and connecting. South African Airlines mostly does domestic flights only. Electricity is constantly being cut off. This is not helping with business. The South African airline is the most sophisticated in the continent, and even they have problems.

There are problems also with loans, and with the banking system. In fact, banks will finance real estate and that's probably about it. There are many stories of African entrepreneurs who went to the U.S. or Europe or the Middle East to get the capital they need to build their businesses. The sophistication of the banking system in Africa generally is very low, which is why the African money is going to Dubai, where they receive the range of financial services that they need but don't receive at home. This is also why Mauritius is pushing to become the hub of private banking in Africa, an alternative to Dubai.

CVR —
The path for change sounds complicated – how do you bring this all together into a unifying framework?

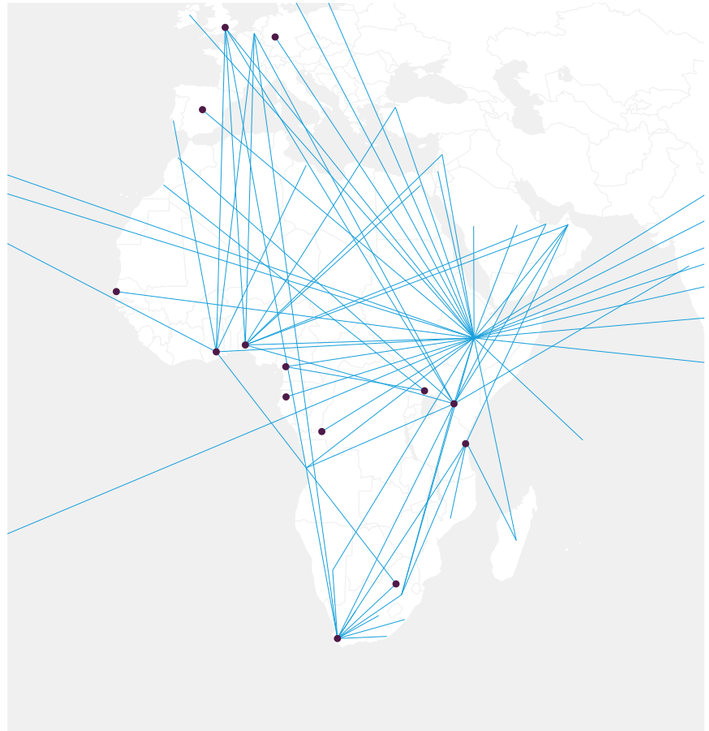
Grammig —
For us, it always starts with the relationship. There are families with four generations of wealth, and it's critically important to build trust and be able to work across not just across countries, but also within countries, across generation. There is also huge heterogeneity. For example, f you google Kenya's richest families, 4 out of 5 have Indian backgrounds. They are Africans with Indian roots – and this is also partially in South Africa, Kenya, and Tanzania. So culture as well as ethnicity plays a huge role in each and every relationship.

In addition, now that the continent is growing, there is a lot of new wealth. But clever entrepreneurs are not always such clever investors – this is a different kind of diversity, a sort of intellectual and experiential heterogeneity. So we have to address that too, in building the relationship. In this case, we help members of our network not just to seize opportunities, but then to think what to do with it, how and where to invest. There are endless interaction effects – in this case, the new money is learning from the old money how to preserve wealth.

Finally, we keep in mind context and history. A family that made its wealth in agriculture, for example, and is struggling with climate change… has a very different set of challenges than a family that started out in mining.

CVR —
How do you relate the micro and the macro – the families and the continents?

Grammig —
Well, at the family level, it's clear that I'm not African. And I've had to learn – it's important to recognize – that they have different family networks – that they are, for example, patriarchal with large families. This makes a difference. And it makes a difference if you have a Christian or a Muslim family, it makes a difference if everything is being split between the children or passed on to the first born. You have to find and understand their own way of doing it.



Beyond that, one has to understand if a family wants to invest outside of the country, or maybe even outside the continent. Some have the notion that one has only really made it if they're recognized in the U.S. and Europe. It's a real asymmetry of sorts – while African Americans are realizing they want to invest on the continent, the locals are pushing the money out.

When we work together, we look for opportunities abroad as well as on the continent. And we understand the unique challenges of each. For example, we had a Kenyan family that spoke about their biggest failure, and it was their failed expansion into Tanzania. When they spoke to a Tanzanian family that we brough them together with, the Tanzanian family said "Everything you did was wrong. But also what was wrong was also the conclusion you drew from it." And in this way, they learned from each other. They actually entered a joint venture, and are now working together. They need to learn from each other still.

This working through the families and then through the families across the continent is no small task. I spoke to a gentleman from Nigeria who asked, "Do you understand the continent"? And I said "No, but neither do you. You as a Nigerian don't understand the Kenyans and the Mauritians. This is exactly why I'm doing what I'm doing. So you can learn from one another, and work on things together."

> As a non-African, you don't go by yourself. You need the local partner...if you go to Zimbabwe and buy a blueberry farm, two weeks later it's no longer yours

CVR —
Beyond everything you have already shared with us, how would you help us understand the broader culture – i.e., what should those thinking about working in Africa remember to keep in mind?

Grammig —
Great question. Here I would say Africa is still really protective. I think it's best summarized as "Whatever I share with you, you will use against me to my disadvantage." Remember – If you've made it in an African country, you've made it despite the circumstances – despite a lack of education, workers, corruption. You made it because you were clever and smart and navigated the system. So the thinking is – the more I tell you about the system, the more I give away and then you become a competitor. But this needs to change, so everyone can work together and expand, and this is something we are trying to help change.

CVR —
In summary, and as you look ahead , can you summarize for us the success that you aspire that efforts like yours will bring about twenty years from now?

Grammig —
Absolutely. First, for all of us, it's about sharing and growing cultural know-how – confidence vision, and horizons.

Beyond that, I aspire that there will be greater connectivity between families to talk to each other, and work together and align their activities, whether in business or philanthropy – to have trust and collaboration with one another. With the African free trade agreement, the first step has been made, but Africa is still very fractured. Even greater connectivity between economies will facilitate free trade, and greater connectivity between private actors will make them a little less private, and open for real collaboration with their peers. I think of this practically as "We have a background in healthcare, so let us take care of hospitals and you take care of education, even if we work in your country and you put your network in ours."

It's amazing how much is being done on the continent, but still they are all doing it on their own. They have so much work ahead of themselves, if everyone cooks their own broth, it's won' be quick enough to get Africa where it needs to be. What is important – and what we fundamentally aspire to – is a geographic approach where tons of individual entrepreneurs work hand-in-hand with one another, and with governments. It will ultimately be a collaboration of global and local player players who will take know-how, technology, and funding, and drive change. ■

> I hope there will be greater connectivity between economies to facilitate free trade, and greater connectivity between private actors, to make them a little less private, and open for real collaboration with their peers. I think of this practically as 'We have a background in healthcare, so let us take care of hospitals and you take care of education, even if we work in your country and you put your network in ours.' If everyone cooks their own broth, it's won' be quick enough to get Africa where it needs to be

About

David Grammig is based in Zurich, Switzerland, and is the visionary behind an exceptionally unorthodox network-building approach in the family office space, leveraging his career experience in banking, intelligence and business development industries.

As former Director for International Relations at a GCC-based single family office, David has established, and continues to grow, valued connections with fellow family offices over the years. David lives by the credo "no level of technological sophistication can replace a handshake," which is no different regarding his family office networks.

Coller Venture Digest

Coller Venture Digest refers our readers to some of the year's best reads in venture, as suggested by the members of our Advisory Board.

These articles cross the gamut from Entrepreneurial Team Formation to Funding New Ventures, Leadership in Venture, Public Policy and Entrepreneurship, Success in Venture Creation, and Change in Private Equity.

Our digest will continue to be updated, and we are pleased to provide hard copies upon request.

Entrepreneurial Team Formation

Rapid Response Through the Entrepreneurial Capabilities of Academic Scientists

Andrew Park; Azadeh Goudarzi; Pega Yagmaje; Varkey Jon Thomas; Elicia Maine
Nature, pages 802–807 (2022)

https://www.nature.com/articles/s41565-022-01103-6

Academic scientists play a central role in the production and translation of breakthrough scientific inventions through the formation of university spin-offs. Well-endowed science-based ventures, attracting resources and advancing novel capabilities, can rapidly respond to pressing global health and humanitarian crises such as COVID-19. Policymakers are highly motivated to leverage university science for the dual purpose of solving emerging challenges and increasing economic productivity. Yet scholars suggest that, despite increasing investment by the United States government in university research, innovation ecosystem growth is lower today than it has been in the previous four decades. And yet Academic scientists who develop entrepreneurial capabilities can make strategic, path dependent decisions that enable university spin-offs to rapidly respond to global crises.

The Transformation of Self-Employment

Innessa Colaiacovo; Margaret G. Dalton; Sari Pekkala Kerr & William R. Kerr
NBER Working Paper 29725, February 2022

https://www.nber.org/papers/w29725

Over the past half-century, while self-employment has consistently accounted for around one in ten of the United States workforce, its composition has changed. Since 1970, industries with high startup capital requirements have declined from 53% of self-employment to 23%. This same time period also witnessed declines in "hometown" local entrepreneurship and the probability of the self-employed being among top earners. Using 2016 data, we show that high startup capital requirements are linked with lower profitability at small scales. The transition away from high startup capital industries appears most closely linked to changes in small business production functions and less due to advantageous reallocation to other opportunities, growth in returns-to-scale among large businesses, or a worsening of financing conditions and debt levels.

Funding New Ventures

Invention Value, Inventive Capability, and the Large Firm Advantage

Ashish Arora; Wesley M. Cohen; Honggi Lee; and Divya Sebastian
NBER Working Paper Series, Working Paper 30354

https://www.nber.org/digest/202211/

Larger firms tend to profit more from their inventions than do their smaller counterparts. In this paper, the authors find that this does not occur because large firms produce inventions of higher technical quality. Rather, it is because they extract more value from their inventions, likely through more effective commercialization, which includes product development, marketing, distribution channels, and manufacturing. The researchers estimate that doubling a firm's size is associated with an increase of between 5 and 16 percent in the value of a given invention, depending on whether or not one controls for the firm's capitalization.

Bucking the Trend: Why do IPOs Choose Controversial Governance Structures and Why do Investors Let Them?

Laura Casares Field; Michelle Lowry
Journal of Financial Economics Volume 146, Issue 1, October 2022, Pages 27–54

https://www.sciencedirect.com/science/article/abs/pii/S0304405X2200143X

While the percentage of mature firms with classified boards or dual class shares has declined by more than 40% since 1990, the percentage of IPO firms with these structures has doubled over this period. We test whether IPO firms implement these structures optimally or whether they are utilized to allow managers to protect their private benefits of control. Both shareholder voting patterns and changes in firm types going public suggest that the Agency Hypothesis best explains IPO firm's use of dual class, particularly when there is a large voting-cash flow wedge. In contrast, among firms with high information asymmetry, classified board structures are better explained by the Optimal Governance hypothesis.

Leadership in Venture

Does Workplace Spirituality Influence Knowledge-Sharing Behavior and Work Engagement in Work?

Jawad Khan, M Usman; Imran Saeed; Amna Ali; Hena Gul Nisar
Management Science Letters Volume 12 Issue 1 pp. 51–66, 2022

DOI: 10.5267/j.msl.2021.8.001

Management scholars view workplace spirituality as the main factor behind building trust among employees and playing a pivotal role in enhancing the organization's positive outcomes, i.e., knowledge sharing behavior & work engagement. Underpinning social exchange theory, we explored the linkage between workplace spirituality, knowledge sharing behavior, and work engagement. We further studied to look at the mediating effect of trust between workplace spirituality and positive outcomes. Data was collected from six private companies, the total number of respondents was (n=196). The study's analysis showed that workplace spirituality substantially positively impacts knowledge sharing behavior and work engagement. Furthermore, the link between workplace spirituality, knowledge sharing behavior, and work engagement is positively and statistically significantly mediated by trust. Thus, this work contributes significantly to the research paradigm by presenting workplace spirituality as a solution for high-rise trust among employees, fostering employee engagement in their work, and improving the capacity of knowledge-sharing behavior. Additionally, at the end of this study, theoretical and managerial suggestions, future avenues, and limitations are stated.

Public Policy and Entrepreneurship

Entrepreneurship in Times of Crisis

Steven Pattinson and James A. Cunningham
The International Journal of Entrepreneurship and Innovation Volume 23, Issue 2, 2022

https://doi.org/10.1177/14657503221097229

These are unprecedented times for entrepreneurs, innovators and their ventures in all sectors. Some have repurposed their ventures and expertise to support the common effort to support communities and frontline workers dealing with the COVID-19 pandemic. Others face critical decisions about the future viability of their ventures for economic and political reasons. For example, the conditions for supporting entrepreneurship during crisis are especially challenging for entrepreneurs and small businesses due to the high levels of economic uncertainty created. Conversely, entrepreneurs play a crucial role in helping economies overcome crisis through the generation of innovations that support, inter alia, new ways of working. Some entrepreneurs will face the difficult decision to close their ventures and have to deal with the stigma of business failure. From business failure other entrepreneurs will consider creating another venture.

Public Policy and Entrepreneurship

Executive Stock Options and Systematic Risk

Christopher Armstrong; Allison Nicoletti; Frank S.Zhou
Journal of Financial Economics
Volume 146, Issue 1, October 2022,
Pages 256–276

https://doi.org/10.1016/j.jfineco.2021.09.010

Employing a novel control function regression method that accounts for the endogenous matching of banks and executives, the authors find that equity portfolio vega, the sensitivity of executives' equity portfolio value to their firms' stock return volatility, leads to systemic risk that manifests during subsequent economic contractions but not expansions. They further find that vega encourages systemically risky policies, including maintaining lower common equity Tier 1 capital ratios, relying on more run-prone debt financing, and making more procyclical investments. Collectively, the evidence suggests that executives' incentive-compensation contracts promote systemic risk-taking through banks' lending, investing, and financing practices.

Success in Venture Creation

Mitigating or Magnifying the Harmful Influence of Workplace Aggression: An Integrative Review

Rui Zhong, Huiwen Lian; M. Sandy Hershocovis; Sandra L. Robinson
Academy of Management Anals
28 Oct 2022

https://doi.org/10.5465/annals.2021.0144

As a substantial amount of research has accumulated on the harmful consequences of workplace aggression for target employees, the authors believe it is now of particular importance to examine moderators that alleviate or amplify these harmful effects. They ask the following questions: For whom is workplace aggression more or less detrimental? Moreover, what can target employees and the organization do to mitigate the harmful effects of aggression? The authors propose to address these questions with an integrative review of empirical research on moderators of the harmful effects of workplace aggression on targets. In this review, they identify and illustrate five broad perspectives that existing research has primarily used to explain the moderating effects: resource-depletion, social-relational, appraisal, self-regulation, and social-influence perspectives. In addition, they identify a large number of moderators and synthesize them into three categories of individual moderators—trait-based, intrapersonal, and coping-based—and three categories of contextual moderators—collective, interpersonal, and job-based. They conclude with a general discussion of an overarching summary, redundant and saturated findings, as well as research gaps and future directions.

Success in Venture Creation

Teaching Entrepreneurial Negotiation

Stephen Humphrey; Robert Macy; Cynthia Wang
Negotiation Journal
Volume 38, Issue 1, January 2022

https://onlinelibrary.wiley.com/doi/epdf/10.1111/nejo.12377

Despite the importance of negotiation skills to entrepreneurs, the pedagogy of teaching entrepreneurship has not been fully developed. This paper provides guidance to educators in designing and delivering negotiation content with an entrepreneurial focus. The article identifies the unique challenges to entrepreneurial negotiations, unpacks critical concepts, and lays out a guide for teaching entrepreneurial negotiation using educational content.

Systematic Change in Private Equity

Mapping the Venture Capital and Private Equity Research: A Bibliometric Review and Future Research Agenda

Cumming, D., Kumar, S., Lim, W.M. *et al.*
Small Business Economics
October 2022

https://doi.org/10.1007/s11187-022-00684-9

The fields of venture capital and private equity are rooted in financing research on capital budgeting and initial public offering (IPO). Both fields have grown considerably in recent times with a heterogenous set of themes being explored. This review presents an analysis of research in both fields. Using a large corpus from the Web of Science, this study used bibliometric analysis to present a comprehensive encapsulation of the fields' geographical focus, methodological choices, prominent themes, and future research directions. Noteworthily, the foundational themes in venture capital research are venture capital adoption and financing processes, venture capital roles in business, venture capital governance, venture capital syndication, and venture capital and creation of public organizations. In private equity research, style drift into venture capital emerges as a key theme alongside buyouts and privatization, and valuation and performance of private equity investment.

Advisory Board

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Professor Gad Allon is the Jeffrey A. Keswin Professor and Professor of Operations, Information and Decisions, and the Director of the Management and Technology Program at the University of Pennsylvania.

Professor Allon's research interests include operations management in general, and service operations and operations strategy in particular. He has been studying models of information sharing among firms and customers both in service and retail settings, as well as competition models in the service industry. His articles have appeared in Management Science, Manufacturing and Service Operations Management and Operations Research. Professor Allon won the 2011 "Wickham Skinner Early-Career Research Award" of the Production and Operations Management Society. He is the Operations Management Department Editor of Management Science and serves on the editorial board of several journals.

Professor Allon is the Co-founder of ForClass, a platform that enables professors to drive higher student engagement and accountability in their classrooms. He regularly consults firms both on service strategy and operations strategy.

Professor Allon holds a Ph.D. in Management Science from Columbia Business School in New York and holds a B.A. and M.A. from the Technion—Israel Institute of Technology. ■

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Professor Shai Bernstein is an Associate Professor in Entrepreneurial Management at Harvard Business School and a Faculty Research Fellow at the National Bureau of Economic Research (NBER). His research focuses on financial issues related to startups and high growth firms, and their interaction with innovation and entrepreneurial activity. Prior to joining Harvard Business School, he was a faculty member at Stanford Graduate School of Business.

Some of his latest research includes: *Does Venture Attract Human Capital and The Creation of Evolution of Entrepreneurial Public Markets*

Professor Bernstein holds a Ph.D. in Business Economics from Harvard University. ■

Prof. Francesca Cornelli

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Professor Francesca Cornelli is the Dean of Northwestern University's Kellogg School of Management. She is also a Professor of Finance and holds the Donald P. Jacobs Chair of Finance.

Previously, she was Professor of finance and Deputy Dean at the London Business School. She directed and advanced the Private Equity Institute of London Business School, building a bridge between academia and practice by partnering with private equity leaders in London, alumni and top academics in the field.

Professor Cornelli's research interests include corporate governance, private equity, privatization, bankruptcy, IPOs and innovation policy. She has been an editor of the Review of Financial Studies, and previously served on the board of editors of the Review of Economic Studies and as an associate editor at the Journal of Finance. She is a research fellow at the Center for Economic and Policy Research, and previously served as a director of the American Finance Association.

In January 2016 Professor Cornelli helped create and became a board member of AFFECT, a committee of the American Finance Association designed to promote the advancement of women academics in the field of finance.

Professor Cornelli holds an M.A. and Ph.D. in Economics from Harvard University and a B.A in Economics, *summa cum laude,* from Università Commerciale Bocconi. ■

Prof. Gary Dushnitsky

Associate Professor of Strategy & Entrepreneurship, London Business School

Professor Gary Dushnitsky is an Associate Professor of Strategy & Entrepreneurship at the London Business School. He serves as a Senior Fellow at The Mack Institute for Innovation Management at the Wharton School, University of Pennsylvania.

Professor Dushnitsky's work focuses on the economics of entrepreneurship and innovation, and he advises corporations in the Financial Industry, FMCG, Clean Tech, and Pharma sectors. He explores the shifting landscape of entrepreneurial finance, exploring such topics as corporate venture capital, crowdfunding, and accelerators. His research appeared in leading academic journals, including *Organization Science*, *Strategic Management Journal*, *Strategic Entrepreneurship Journal*, and *Nature Biotechnology*.

Professor Dushnitsky serves as the Co-Editor of the *Strategic Entrepreneurship Journal*. He received academic distinctions including the 2013 SMS Emerging Scholar Award and the 2009 Kauffmann Junior Faculty Fellowship, has been featured in Business Week, CNBC, Dow Jones News, Entrepreneur Magazine, Financial Times, and has participated at the YPO, World Economic Forum, OECD, EVCA, and BVCA.

Professor Dushnitsky holds a Ph.D. in Strategy from New York University and a B.A. and M.Sc. from Tel Aviv University. ■

Prof. Joshua Lerner

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Professor Joshua Lerner is the Jacob H. Schiff Professor in Entrepreneurial Management at Harvard Business School. His research focuses on venture capital and private equity organizations, particularly policies on innovation and how they impact firm strategies. He has authored several books and publications including *The Architecture of Innovation*, *The Comingled Code*, *Innovation and Its Discontents*, *Boulevard of Broken Dreams*, *The Money of Invention*, *Patent Capital*, and *The Venture Capital Cycle*.

Professor Lerner co-directs the National Bureau of Economic Research's Productivity, Innovation, and Entrepreneurship Program and serves as co-editor of their publication, *Innovation Policy and the Economy*. He founded and runs the Private Capital Research Institute, a nonprofit devoted to encouraging access to data and research, and has been a frequent leader of and participant in the World Economic Forum projects and events.

He is the winner of Sweden's Global Entrepreneurship Research Award and the Cheng Siwei Award for Venture Capital Research.

Professor Lerner holds a Ph.D. in Economics from Harvard University and graduated from Yale College with a special divisional major. ■

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Professor Ella Miron-Spektor is an Associate Professor of Organizational Behavior at INSEAD. Her research focuses on personal and organizational factors that promote creativity, learning, and entrepreneurial success. She studies team characteristics that contribute to innovation and learning, the formation of entrepreneurial teams, strategies that enable leaders to cope with competing demands at work, and the influence of cultural diversity on creativity.

Professor Miron-Spektor's award-winning research studying factors that contribute to team innovation and learning has been published in top management journals, including the *Academy of Management Journal*, *Organization Science*, *Organizational Behavior and Human Decision Processes*, and *Journal of Applied Psychology*.

Her work has been profiled in media outlets such as Harvard Business Review, Forbes, CBS, and NBS news. She co-organized several international conferences, including the Academy of Management Specialized Conference: From-Start-up to Scale-Up in 2018. She serves on the Editorial Review Board of Organization Science and as Guest Editor for Organizational Behavior and Human Decision Processes and Academy of Management Discoveries.

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Prof. Scott Stern

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Professor Scott Stern is the David Sarnoff Professor of Management at the MIT Sloan School of Management and a Professor of Technological Innovation, Entrepreneurship, and Strategic Management. He was previously a Professor at the Kellogg School of Management and Non-Resident Senior Fellow at the Brookings Institution.

Professor Stern's research explores how innovation and entrepreneurship differ from traditional economic activities, and the consequences of these differences for strategy and policy. His research in the economics of innovation and entrepreneurship focuses on entrepreneurial strategy, innovation-driven entrepreneurial ecosystems, and innovation policy and management.

In 2005 he was awarded the Kauffman Prize Medal for Distinguished Research in Entrepreneurship.

Professor Stern works with practitioners in bridging the gap between academic research and the practice of innovation and entrepreneurship through advising startups and other growth firms in the area of entrepreneurial strategy, as well as working with governments and other stakeholders on policy issues related to competitiveness and regional performance. He is the director and co-founder of the Innovation Policy Working Group at the National Bureau of Economic Research.

Professor Stern holds a Ph.D. in Economics from Stanford University and a B.A. in Economics from New York University. ■

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Professor Zviran's research interests include entrepreneurship and innovation, information and cyber security, and information systems planning and policy. He has published numerous articles and authored two books on Information Systems. He is a consultant for leading organizations in Israel and serves as a board member in several companies and organizations.

Professor Zviran held academic positions at the Naval Postgraduate School, The Claremont Graduate University, and Ben-Gurion University.

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Dr. Broudo holds an MBA from the Wharton School of the University of Pennsylvania in Management and Operations, a Ph.D. in Anthropology from the University of Pennsylvania, and a B.A. in Political Science and Economics from Bryn Mawr College. ■

In theory, theory and practice are the same. In practice, they are not.

Albert Einstein

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