TOOLKIT FOR A **NETWORKED WORLD**

Over the last half century, we've watched in awe as the world cracked open and came online. In the next decade, we'll be rocked by aftershocks that will transform the very concept of economy.

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INSTITUTE FOR THE FUTURE

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After just ten years, Facebook signed up its one billionth user.

After just five years, Uber vehicles exceeded yellow taxis in New York City.

After just twenty-four hours, Apple's ResearchKit had signed up more participants for research studies than 50 combined medical centers previously were able to over an entire year.

This is the networked world of the 21st century, and it's just getting started.

In the world that's fast approaching, the newspapers and television stations of mainstream media have been completely fragmented into billions of blog posts, tweets, and YouTube videos. The workstreams of every industry have been fragmented into millions of disaggregated tasks to be performed by microworkers and autonomous algorithms. Even our identities have been fragmented into millions of micro-attributes and social graphs that follow us from platform to platform. If the world feels chaotic right now, it's because we're actively deconstructing the institutions of our past in order to build the foundations for our future.

Amidst the turmoil of this transition, the opportunity of the next decade is to reconnect these deconstructed pieces in new ways—not just to rebuild the world we knew, but to build a world that works for a hyperconnected global population of eight billion.

A quick introduction to APIs

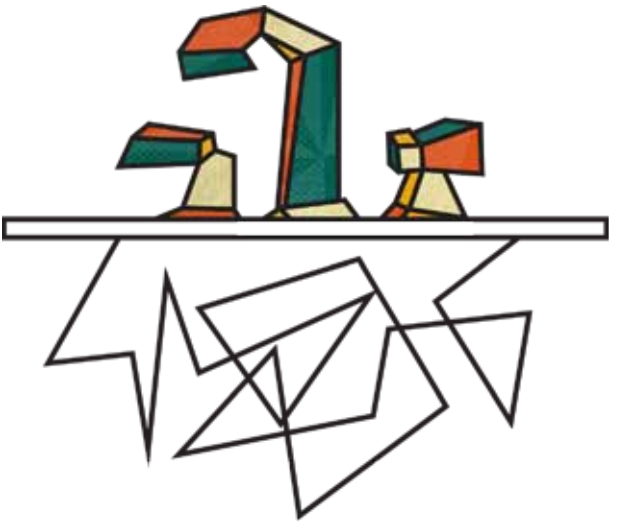
Before we dive into the opportunities of the networked world, we need to understand the disruptive mechanism at the heart of this story: the API, or Application Programming Interface.

Think of APIs like the kitchen sink.

The kitchen sink provides a direct interface to the plumbing and sewer infrastructure of your region. It offers simple handles for requesting water of a certain temperature. Its faucet delivers that water in a consistent and timely way. To use it, you don't need to understand how the infrastructure works, or even know that the infrastructure is there. The sink takes an extraordinarily complex system and exposes it to regular people in a simple and obvious way.

Now, imagine that your plumbing could easily deliver not just water, but any resource in the world. And imagine that the sink, the user interface, could be redesigned on the fly to accommodate any new situation.

APIs are the hidden interfaces that determine how individual nodes interact with each other over networks. They provide handles that allow people or services to ask for something—like a room for the night, transportation to the airport, or a microworker to design your logo—and then deliver that information or service in a consistent way. They also define the terms of the transaction, meaning that multiple business models can be pursued from the same essential interface.



But seriously, why should I care about APIs?

As more of our world moves online, APIs are the gatekeepers that define the relationships between organizations, people, information, and services. They dispatch the cars and hotel rooms of Uber and Airbnb. They manage and scale the internal capacities of tech giants like Amazon. And they allow services like Google Maps and YouTube to propagate across the entire internet with ease. For companies, governments, and entrepreneurs, APIs are key to understanding the new rules and rights of way of the emerging networked world.

STRUCTURES BUILT ON APIs...

- **Lower the transaction cost** of communicating and delivering services to almost zero, enabling entirely new value propositions for existing assets, resources, and information flows.
- **Create two-way channels** in industries that are accustomed to one-way transactions, blurring the traditional lines between production and consumption.
- **Define pre-programmed contracts** that facilitate low- or no-cost partnerships with millions of others, allowing services to scale extraordinarily quickly and cheaply.
- **Measure and trade any value** that can be quantified, effectively transforming abstract concepts like “identity” and “trust” into fungible currencies.

Over the next decade, the logic of APIs will guide the organizational strategies of superstructed economies, the Internet of Things, and beyond that, the Age of Networked Matter. They are foundational to the future we are hurtling towards and, importantly, they are not all created equal. This toolkit provides guidance for how APIs work as part of an organizational strategy—and how they can redefine your organization’s concept of itself and its place in the rapidly changing global economy.

The three-step guide to the networked world

What's your right of way in today's fledgling networked world? Three simple steps will help you discover the hidden potential within your organization's existing resources. They will lay out alternative paths using alternative interfaces. And they will clarify your priorities, helping you choose the right strategy for creating networked services to address them.

STEP 1 WHAT ARE YOU STARTING WITH?

Every organization has untapped assets and capacities that can yield value of some kind by exposing them to the larger network. STEP 1 helps you identify that value *(p. 6).*

STEP 2 WHAT KIND OF INTERFACE WILL YOU USE?

When you're creating an API, you're designing an interface. You can create a thousand interfaces, but they will likely take one of three basic forms. STEP 2 helps you choose which form best suits your situation *(p. 10).*

STEP 3 WHAT IS YOUR HIGHEST PRIORITY?

Priorities are all about what you value. Maybe it's unmatched user experience or community goodwill. Maybe it's an honest profit or an uncompromising blend of anonymity and accountability. STEP 3 helps you explore the four archetypes that will guide you in implementing any new API service *(p. 12).*

STEP 1

What resources are you starting with?

The largest opportunity of the networked world is to surface value from your existing resources and capacities. But first, you must take an inventory of what you have, especially those assets that you've never considered to be valuable—or perhaps those assets that appear stranded.

IDLING ASSETS

Everyone has existing assets lying around that are full of unrealized potential, such as unused land, spare bedrooms, parked trucks, empty barrels, or old television shows. API-enabled services empower you to connect these assets to people and organizations that might need them, whoever or wherever those people might be. They do this by advertising the availability of assets in real time and by lowering the transaction cost of accessing those assets to almost zero.

LEVERAGING IDLING ASSETS WITH APIs

In 2015, delivery startup Roadie needed accessible spaces across America to temporarily store their customers' packages while en route. Breakfast franchise Waffle House became their unlikely partner, leveraging their many locations and unused storage space through APIs.

What are your idling assets?

What do you have that might be of value to others if it cost you nothing to make it available?

AUXILIARY CAPACITIES

Many organizations have functional abilities that they've developed for internal operations—a quality control process, a risk analysis tool, an algorithm for managing R&D projects. In the networked world, a little rewiring can transform such internal capacities into a new external offering.

What are your auxiliary capacities?

What internal competencies would be useful to others if it cost you nothing to adapt them for other purposes?

BUILDING ON AUXILIARY CAPACITIES WITH APIs

When Amazon was founded, CEO Jeff Bezos insisted that all internal departments communicate exclusively through APIs. After the company had scaled their online retail platform, they realized they could convert this internal cloud-computing capacity into a massively successful side business, Amazon Web Services.

RELIABLE INFORMATION

Big data is the obvious domain of the networked world, but not all data is obviously useful. Anything you can measure and share, whether it's soil PH, a database of regional populations, or a list of people's favorite meals, is fair game for API-based services. You don't have to anticipate all the use cases—you just have to model the data and let people come to you.

What reliable information do you have?

What data could you model and share that would be difficult for people to acquire on their own?

TAPPING RELIABLE INFORMATION WITH APIs

Body Labs is a startup that collates data about the human form from existing medical research. In 2015, they launched the BodyKit API to expose that information to other services, with the ambition of becoming the "most powerful way to build apps and tools around the human body."

TRUSTED RELATIONSHIPS

If you have relationships with people, you have something of value. Beyond just using personal information to target ads at desired demographics, your unique understanding of people's skills, experiences, or preferences has virtually limitless uses in the networked world, provided you can maintain community trust as you share it.

What are your trusted relationships?

What communities do you have access to, and how could you provide insights for more personally tailored experiences outside of your business?

AMPLIFYING TRUSTED RELATIONSHIPS WITH APIs

Disqus provides most of the internet's comment sections through an API that anybody can easily embed in the pages of their website. When someone creates a login with Disqus, their identity, commenting history, and community automatically follow them from site to site.

STEP 2

What kind of interface will you use?

The next step is to envision what kind of networked service will surface the most value from those resources you identified in STEP 1. APIs are incredibly flexible, but three essential forms of these interfaces provide the basis for any new service.

DISPATCH

The Dispatch interface is employed by services like Uber, Airbnb, and Instacart to connect people with resources and resources with people. This API works in both directions, allowing Uber customers to request a ride from a specific location, and telling Uber drivers where to pick up their next fare. This general principle can be applied to any asset, capacity, or piece of information, signaling the existence and availability of a resource—and providing direct pathways for acquiring or accessing it.

INTERPRET

The Interpret interface adds value to existing information by providing a larger context for that information. Yelp doesn't actually create anything, but adds value to physical addresses by providing customer ratings, restaurant menus, and business hours to anyone asking about the address. LinkedIn's API shares information about people's professional history with websites and services that properly request it. Interpret APIs contribute to the functional knowledge base of the entire network, making the internet itself smarter.

EMBED

The Embed interface provides services within another service, allowing Facebook's Like buttons, YouTube's video players, and Disqus' comment sections to become built-in features of any other website or service. Embedded interfaces can also act like plumbing, extending the back-end functionality of an existing service. Amazon Web Services provides content distribution infrastructure for Netflix and iTunes, and Apple Pay facilitates convenient financial transactions for any iPhone app.

CREATING SERVICES FOR A NETWORKED WORLD

Imagine that anyone could have immediate access to your resources and capacities with a snap of their fingers or the push of a button. Who might want that extra soap in your hotel bathrooms or the glove box space in your trucking fleet? Who could really benefit from your back-end logic or the templates you use to create service contracts? And how might a Dispatch interface be used to deliver that extra soap or an Interpret interface be used to apply your contract know-how to hundreds of urban services?

Mix and match resources and interfaces to create entirely new services:

DISPATCH

Resource: _____

Who needs this resource? _____

_____

What's the service? _____

_____

_____

_____

_____

INTERPRET

Resource: _____

Who needs this resource? _____

_____

What's the service? _____

_____

_____

_____

EMBED

Resource: _____

Who needs this resource? _____

_____

What's the service? _____

_____

_____

STEP 3

What is your highest priority?

Even after you choose an interface for your networked service, there are multiple strategies and business models that can be applied to the interaction to determine how information and goods are accessed and what value is traded in exchange. Having clarity about your priorities will help you choose from equally accessible but vastly different value propositions, all made possible by APIs.

As you define the rules of these transactions, consider that you are not just designing value flows for dozens or hundreds of interactions a day, but potentially for millions of interactions an hour. What are your priorities, and how will they scale to the networked world?

The Competent Bureaucrat
Maximize user experience and satisfaction

The Honest Merchant
Maximize short-term gain

The Community Maker
Build community and public goodwill

The Secret Agent
Build a network of distributed trust

MAXIMIZE USER EXPERIENCE AND SATISFACTION

The Competent Bureaucrat

The goal of the **Competent Bureaucrat** is to provide a frictionless yet secure experience to authorized members of the system, so that people ideally don't even know when they're passing through an API. It's like an E-ZPass for the entire world, creating a magically futuristic experience where the elevator automatically takes you to the right floor and your hotel room door unlocks as you approach. The Competent Bureaucrat sits behind every interaction, determining the optimal solution before we get there and acting on our behalf as often as possible. This is the strategy for smart cities, private infrastructure, and internal organizational functions.

Disney's MagicBand provides a seamless experience for park guests, allowing them to hold a place in line, check into the hotel, and purchase meals with a simple swipe of the wrist.

Apple's platform APIs seek to connect all their user's information in ways that "just work," without those users needing to understand how the iCloud, HealthKit, or AirPlay APIs function behind the scenes.

If you go this route...

The Competent Bureaucrat enables the fully connected smart planet of big data's marketing fantasies.

However, it requires strict standards for interactions and authorizations, as well as a benevolent centralized government, platform monopoly, or high-trust ecosystem to enforce those standards.

MAXIMIZE SHORT-TERM GAIN
The Honest Merchant

Honest Merchants are transactional. They have something of value and expect something in return. It could be money, either in the form of a one-time payment or a subscription. But it might just as easily be an equitable trade. Merchant APIs of the near future will measure and transact value flows like never before, trading essentially anything with quantifiable value as easily as cash. Merchant-based services are generally inclined to promote their wares and will design interactions that are easy to use, emphasizing killer features and clear use cases—and even supporting their functions with customer service.

Airbnb and Uber will connect you to nearby guest rooms and car services through their smartphone apps, but the price for that service may vary greatly based on location or time of day.

Amazon Web Services and Google Maps both provide embeddable services for anyone to use, but Amazon's service is based on a tiered pricing structure where you pay for what you use.

If you go this route...

The Honest Merchant supports the most traditional models of business transactions. It's familiar and obvious, and most people will accept it as the terms of service.
However, explicit payment in any currency represents an inherently higher transaction cost than most other APIs, forcing users to perform a small cost-benefit analysis whenever they want to interact with the service. This provides an opportunity for competitors who can provide a more fluid experience.

BUILD COMMUNITY AND PUBLIC GOODWILL

The Community Maker

Community Maker APIs are built with the belief that commons build communities and that information and tools want to be free to those commons. They walk the walk by creating open and extensible repositories so that people can use and remix resources as they see fit. The Community Maker strategy gives everything it can away for free or for in-kind trade, in the hopes that others will join the commons of open APIs. Maker APIs are not transactional businesses; however, they may be supported indirectly by all kinds of community contributions.

When Twitter first launched in 2006, it used open APIs to build a robust community of developers and users who made their own apps for the service and created now-famous innovations like hashtags. However, Twitter has struggled to build revenue from these origins.

Data.gov represents an early effort to make better use of government data. By using open APIs, it hopes to inspire citizens and cities to find creative uses for this grab bag of information.

If you go this route...

Maker APIs are key to building communities, followings, and long-term goodwill, particularly as a tool for sharing underperforming resources. They build trust and social capital and inspire innovation with a low barrier to entry.

However, the Community Maker API requires alternatives to profit. To maintain community buy-in, returns on investment should accrue to everyone in the community.

BUILD A NETWORK OF DISTRIBUTED TRUST

The Secret Agent

The **Secret Agent** strategy is not as broadly applicable as the others, but it represents a bold foray into a post-national, post-institutional future. If you want to facilitate high-trust interactions in low-trust environments, Secret Agent APIs may be the right choice for you. They distribute trust among many thousands or millions of pseudonymous participants by passing coded messages that can only be interpreted by the intended recipient. This decentralized approach makes it difficult for any one player to create a monopoly or enact a corrupting influence.

Bitcoin is the canonical example of this strategy, a functional global currency without a centralized bank to manage or distribute it. The crypto currency exists purely within the block chain protocol, which is distributed among millions of computers worldwide.

Apple's payment APIs encrypt personal credit card data deep within the device itself, ensuring that not even Apple can access it without the owner's permission.

If you go this route...

Secret Agent APIs afford tremendous independence and privacy while interacting with both friends and strangers across networks of scale. They enable new models of management and governance without the hierarchy of most 20th-century organizations. **However,** they render centralized enforcement of interactions difficult, if not impossible, allowing underground and illegal activity to scale as easily and effectively as legitimate activity.

WHAT ROLE WILL YOU PLAY IN THE NETWORKED WORLD?

The priority you choose for your API will determine the character of your networked service—how people perceive it and what communities and organizations adopt it and build on it. What is your service's vision for itself? How does it fit into the world: as a Competent Bureaucrat, an Honest Merchant, a Community Maker, or a Secret Agent? Once you understand which role you want to play in the world of APIs, you're ready to connect all the dots and pitch your new service.

YOUR NETWORKED SERVICE:

Connect _____
RESOURCE FROM STEP 1

with _____
TYPES OF PEOPLE/ORGS FROM STEP 2

in order to _____ **.**
PRIORITY FROM STEP 3

YOUR PITCH:

_____

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Looking ahead to 2025
superstructed organizations and the Internet of Things

In the near future, our networked business models won't be as limited to app-based services and social media hooks as they may seem today. As everything around us—our cars, homes, and cities—becomes intelligent and interconnected in the emerging Internet of Things, the choices presented by the networked world will pervade every corner of our lives. How will you evolve your present-day capacities and resources to meet the challenges of this superstructed decade?

What kind of future do you want to create?

What happens when almost everything follows the logic of the networked world?

As objects, services, and identity graphs are strung together in increasingly complex ways, the rules of the resulting world will become as flexible and adaptable as the software that controls them. Our daily experience will be shaped by the API transactions used most frequently. What value flows do you want to trade in? What kind of future will you build?

Use the following pages as an ideation guide for future services, thinking through the nature of the world ten years from now, and the networked resources that you might use to fulfill your current mission statement—or an entirely transformed one.

STEP 1 WHAT WILL YOU HAVE TO WORK WITH?

As we create a world of superstructed organizations, an internet of things, and even a world of networked matter, what new assets, capacities, data flows, and relationships will shape the ways we create value? Use this step to create an inventory of the future resources you will have access to in ten years.

STEP 2 WHICH STRATEGY WILL YOU CHOOSE?

The future is yet to be built. Now is your chance to place your stake in the ground. What kind of future do you want to live in? Read through the four future strategies on the following pages and **choose one** that best represents the future you want to create:

- **competent bureaucracy**
- **honest market**
- **community commons**
- **secret agency**

Once you've done that, use your inventory of resources to devise a service that will allow your organization to fulfill this strategy and thrive in the hyperconnected world of 2025.

STEP 3 WHAT FUTURE WILL YOU HELP BUILD?

In a world of ubiquitous connectivity, the strategies and mission statements of today may no longer apply. Take a step back and ask yourself, what is my organization's future value proposition?

STEP 1
What will you have to work with?

FUTURE ASSETS **SMART THINGS**

Includes: advanced wearables, smart appliances, self-managing vehicles

In 2025, our objects and products will come alive with the interconnected awareness of the Internet of Things. They will tune themselves to their surroundings, and interact with all the API-enabled services available to us. Some, such as self-driving cars, will even be able to "own" themselves, routing themselves to where they need to be.

FUTURE CAPACITIES **NETWORKED INFRASTRUCTURE**

Includes: smart energy grids, autonomous driving fleets, Bitcoin exchanges

The highly networked world will empower us to upgrade our currently centralized infrastructure, providing power and transportation from distributed and even decentralized sources. It will become hyperconnected, responding in real time to external factors, and blurring the line between production and consumption for many industrial-scale systems.

FUTURE INFORMATION **SELF-ASSEMBLING DATA FLOWS**

Includes: microbial maps, traffic flows, energy demand

Today, we collect data in fits and starts, with proprietary systems that don't know how to store or share their information effectively with others. Tomorrow, sensors and data-sharing channels will be cheaper and more convenient, and data will begin to assemble itself based on external contexts and algorithmic intent. Imagine Siri could access everything that could be measured, and how you might take advantage of that.

FUTURE RELATIONSHIPS **ID GRAPHS**

Includes: microwork credentials, cross-platform reputation scores, brand communities

We're still negotiating the rules and responsibilities for sharing our identities online, agreeing to terms of service on a case by case basis. As we move towards 2025, the sheer volume of high-resolution identity-related information will drive organizations to focus on what kinds of relationships they want to have with customers, partners, and users. Trust and privacy will become tangible currencies in every networked interaction.

INVENTORY OF A HYPERCONNECTED WORLD

What will your organization make or do in 2025? How will you evolve your present-day capacities and resources to meet the challenges of the next decade?

Take your organization's core competencies forward ten years, and reframe them for a world of ubiquitous connectivity:

STEP 2 **OPTION 1 OF 4**

Which strategy will you choose?

The **competent bureaucracy** wants to create a world of magical experiences and almost zero friction, all while maintaining full accountability. This is the technology-positive future of Star Trek, where every service and institution is connected in highly integrated and consistent ways, and the overall system is optimized to help people reach their potential. Picture a city designed entirely by Apple, where everything from education and employment to justice and rehabilitation is managed through fluid and familiar interactions. Also like the Apple ecosystem, the competent bureaucracy requires high trust across all sectors, and strong adherence to protocols and shared philosophy. If you disagree with the goals or decision-making of this system, it can easily begin to feel like a prison.

Make the Future:

If there were no barriers to accessing or sharing information and resources, what is the best, most magical experience you could create for your customers and partners in the future?

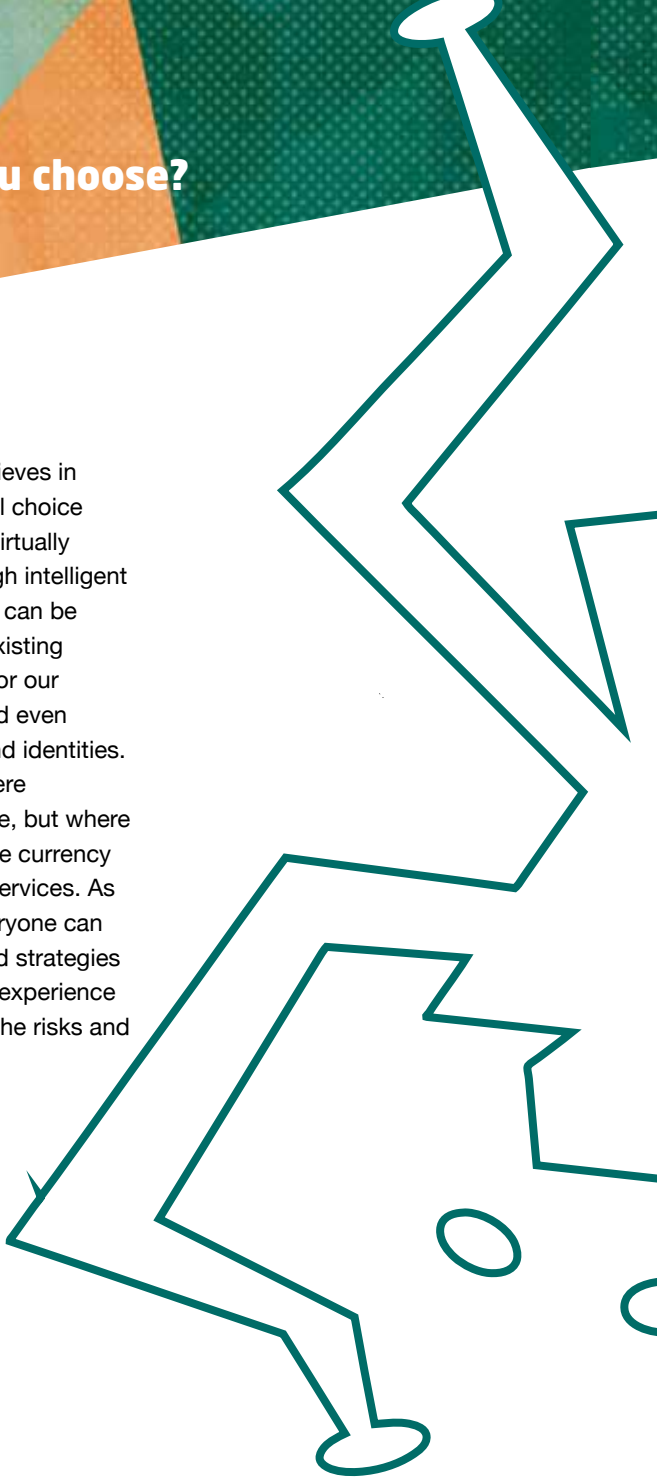
FUTURE SERVICE

What is the future service that will bring this stragegy to life? What does it look like?

STEP 2 **OPTION 2 OF 4**

Which strategy will you choose?

The **honest market** believes in individual agency and personal choice above everything else. When virtually everything is connected through intelligent networks, demand and supply can be determined in real-time—for existing goods and services, but also for our personal belongings, skills, and even aspects of our relationships and identities. This is a world of markets, where everything is potentially for sale, but where we're always negotiating on the currency and price of interactions and services. As in the Android ecosystem, everyone can define his or her own goals and strategies for coming out ahead, but the experience will require all of us to assess the risks and rewards for ourselves.



Make the Future:

In a world where every cost can be assessed in real-time, and where practically anything can be used as a currency, what is your value proposition? What are you selling, and what are people trading in exchange?

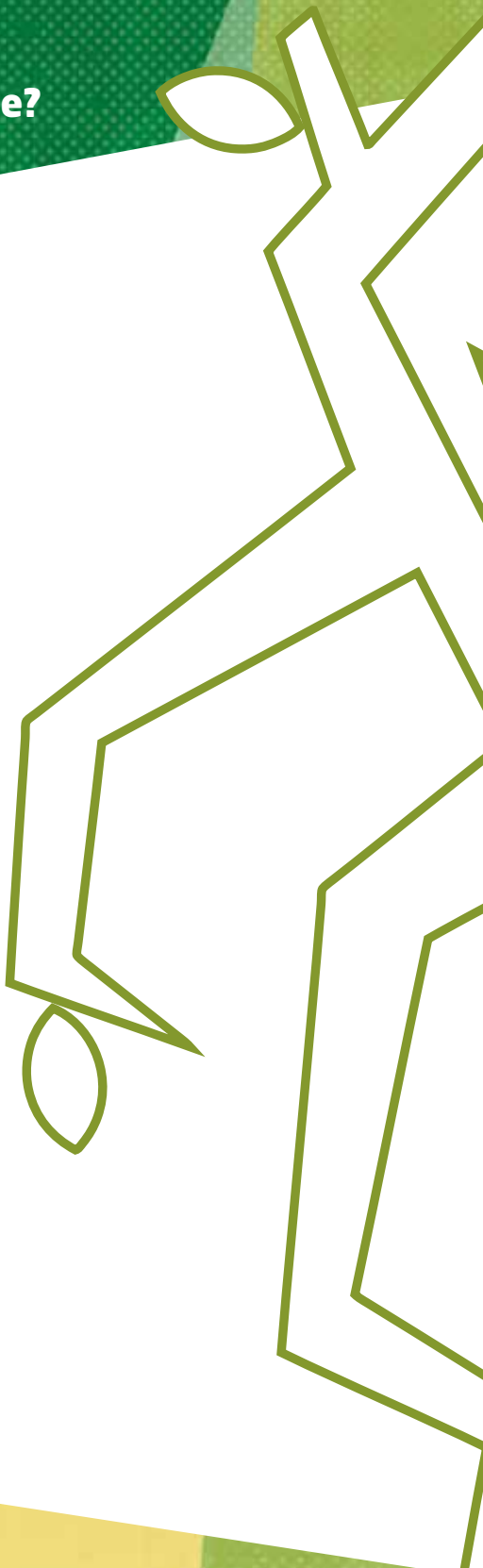
FUTURE SERVICE

What is the future service that will bring this stragegy to life? What does it look like?

STEP 2 **OPTION 3 OF 4**

Which strategy will you choose?

The **community commons** belongs to an open innovation city or a cooperative platform that values human agency and community above all else. Unlike the competent bureaucracy, decisions aren't made from the top-down, they're made from the bottom-up. And unlike the honest market, the currencies that matter most here are those that translate to an open and inclusive world for people to thrive in. The community commons values experimentation and organic growth, even if it leads to less efficient operations than could be achieved otherwise. Like open source software projects, access is not a problem, but the experience is more uneven than in other futures.



Make the Future:

Imagine that you cared for your customers and partners as deeply as you care for immediate family members. How could you remix your resources and services to create a thriving and human-centric community in the future?

FUTURE SERVICE

What is the future service that will bring this stragegy to life? What does it look like?

STEP 2 **OPTION 4 OF 4**

Which strategy will you choose?

The **secret agency** believes that the best future world comes from facilitating many high-trust interactions without having to trust actual individuals all that much. Absolute power corrupts absolutely, and the only way to build something that lasts is to make it impossible for any one person or entity to control it. Like emerging block chain systems, the world of the secret agency allows people to share sensitive information and engage in highly sophisticated transactions without compromising their privacy or anonymity. In the process, it also makes existing social and legal norms difficult to enforce at a broader scale. This is a world where human communities and criminal networks are both thriving, and people buy into the social contract that best serves their needs.

Make the Future:

What are the repercussions for your organization in a world dominated by massive distrust of our traditional systems? How could you function in a radically decentralized way?

FUTURE SERVICE

What is the future service that will bring this stragegy to life? What does it look like?

STEP 3

What future will you help build?

This toolkit is a way to jump-start a thousand new service ideas using a few basic building blocks and the fundamental concept of the API as a gateway to new relationships and value propositions.

As you bring this thinking into your strategic discussions, keep two things in mind:

1. Your critical task is to identify your networked strategy before somebody else identifies it for you.

Recent disruptions in media, transportation, and service industries are not isolated events—they are natural outcomes of a much broader transformation that we're only beginning to understand. With every new resource that we add to the networked world, we are changing the entire value proposition for that resource and unleashing potential new value propositions that were never before possible. This means that every organization must continually re-evaluate the changing value of its resources in the networked world, and the best place to start is a deep dive into the logic and operation of APIs.

2. The networked services we create are not just short-term experiments—they are our bids for the kind of future we want the next generation to inhabit.

The highly networked world we're beginning to build has no predetermined structure. It will adopt the structural logic that we project onto it. Unlike the world of today, the hyperconnected future will fashion its social contract piece by piece with every interaction. Priorities count in this world. There's no one-size-fits-all business model. Instead there are thousands, maybe millions of value models that will help us choose the future we want.

This is our "make the future" moment. The choices we make today will set the precedents for the organizations and communities of tomorrow.

YOUR FUTURE VALUE PROPOSITION:

Ten-Year Forecast

For nearly four decades, the Ten-Year Forecast program has been a leading source of foresight for a vanguard of business, government, and nonprofit organizations. It is a platform for sensing today's latent signals, tracking their intersections to understand the ecosystem of choices, and then designing platforms for future resilience.

Institute for the Future

The Institute for the Future is an independent, nonprofit strategic foresight network celebrating 47 years of "making the future." Spanning a broad territory of deeply transformative trends, from food and health to technology, the workplace, education, governance, and human identity, our work generates the foresight needed to create insights that lead to action. The Institute for the Future is based in Palo Alto, CA.

For more information on the Ten-Year Forecast, see this year's Ten-Year Forecast website at **10YF.iftf.org**.

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