





# Service in the AI Era

*Science, Logic, and Architecture Perspectives*



Jim Spohrer  
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Stephen L. Vargo  
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*Service in the AI Era: Science, Logic, and Architecture Perspectives*

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# Description

**Are you prepared for the coming AI era?** AI advances will profoundly change your daily service interactions, so this book provides readers with *a necessary understanding of service, the application of resources (e.g., knowledge) for the benefit of another*. In just minutes, you can learn about today's use of early-stage AI for automation and augmentation, and essential elements of **service science, service-dominant (S-D) logic, and Service Dominant Architecture (SDA)**.

**Ultimately, improved service for all is possible with human-level AI and digital twins—but requires investing wisely in better models:** Better models of the world both complex natural and social systems (science), better mental models in people to improve interactions (logic), better cultural and structural models of organizations to improve change (architecture), and better trusted and responsible AI models. *The service innovation community studies and builds better models to improve interactions and change in business and society.*

The book challenges all responsible actors—individuals, businesses, universities, and governments—to **invest systematically and wisely to upskill with AI (the X+AI vision)**. The service innovation community is a growing transdiscipline harnessing all disciplines to become better T-shaped professionals. Extensive end notes, bibliography, and index are provided.

## Keywords

artificial intelligence; AI; service innovation; service science; service-dominant (S-D) logic; Service Dominant Architecture (SDA); digital twins; upskilling; T-shaped professionals

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# Prologue

All roads lead to *service*. As you will see, it connects you with the world, and it is the glue that connects important concepts in business and society. Arguably, service is quickly becoming the central concept of our time, as service offerings become infused with advanced technologies like *artificial intelligence (AI)* and scale to new levels of quality, productivity, compliance, and sustainable innovation.

## The Centrality of Service

Why is service so central to human history—so connected to every other important concept? In this short book, you will see that *service is the application of resources* (e.g., knowledge) *for the benefit of another*. Service is the *basis of exchange* (e.g., social, economic). Service is at *the core of value cocreation*—which makes every situation more beneficial and win-win for everyone involved. Service underlies social and economic development, and the wealth of people, businesses, and nations. Simply put, service connects each of us to the world around us.

In terms of connectedness, the term *service* is like the actor Kevin Bacon; seemingly everything in our human world throughout history connects to *service* in just a few steps. In popular culture, the Kevin Bacon Game is played by movie buffs who compete to show off their knowledge of how all other actors and movies connect to Kevin Bacon in just a few steps (usually less than six to eight connections). We will show that human actors applying knowledge to help others is a central concept and connects to:

- Value—what humans value, and *the capability to make and keep promises* or in more technical jargon, *value propositions*, when people interact and cocreate value.
- People—*physical human actors* in biological bodies filling societal roles that possess rights to access resources used in value propositions; helping and being helped by others.



- Organizations—*virtual human actors* with specific purposes, such as businesses, governments, universities, and all types of *enterprises*, with in-network/ecosystem roles and possessing access rights to resources used in value propositions.
- Institutions (e.g., norms, symbols, conventions, rules)—institutional arrangements (i.e., sets of interrelated institutions) are *coordination mechanisms* that guide actor actions and interactions.
- Technology—human actors as tool makers, creating new resources.
- Information—human actors as symbol makers, manipulators and communicators, keeping track of resources and promises kept and broken.
- Cooperation—human cultural evolution and prosocial capabilities to solve larger scale challenges, with networks of people, technology, organizations, and information.
- Learning—development of human actors' capabilities to share and improve knowledge, resources, and prosocial norms; sometimes called *upskilling* in times of rapid change.
- Knowledge—human actors use the scientific method to create *better models of the world*, new resources and competencies by more deeply understanding *phenomena* in the world.
- Resources—how humans see and make use of the capabilities the world has to offer.
- Trust—human ability to interact responsibly with strangers in complex ways while keeping promises, and to create value propositions with *win-win outcomes* (or in technical jargon, *nonzero-sum games*).
- Identity—how humans see themselves, based on memories and aspirations.
- Reputation—how humans see others, based on experiences and expectations.
- Models—how humans simplify *complex systems with many interacting parts that change over time*, including improving *AI models of the world*.

- Civilization—human history, and the growing awareness of better designed win-win (or nonzero sum) interactions, responsibly making and keeping promises.

How does service connect you to your world today? How will those connections change in the AI era? As AI accelerates scientific discoveries, new resources and new types of service are becoming possible for the first time.

## The Phenomenon of Service

You depend on the existence of service as a phenomenon in the world many times every day to live comfortable and productive lives. Saying “you depend on service” is like saying you depend on human interaction and trusting that other people will continue to act responsibly and keep their promises. Certainly, technology failing everywhere would be bad, but service failing everywhere would be a disaster. More practically speaking, consider that from the moment you wake up and turn on the lights and use running water (utilities), travel or use smartphones (transportation and communication), make purchases (retail, finance), see a doctor (health care), learn through an online course (education), watch a movie or listen to a song (entertainment), eat at a restaurant or stay in a hotel (hospitality), or renew a driver’s license (government)—you depend on diverse service offerings and contribute consciously or unconsciously to the realization of their associated value propositions. All of which can be viewed as the application of resources (e.g., knowledge) that is mutually beneficial to the customer and the provider. But what about all the other *stakeholders*, not just the customer and provider? People ask this question, because of the interconnectedness of all this service to the environment, to skills, and to jobs. The world of service is becoming increasingly dependent on responsible and trusted stewards to ensure technology plays its role as promised, without unintended consequences.

Service (like life itself) is both fundamental and diverse, which makes it hard to get everyone to agree on a single definition. *Life requires resources*—such as matter, energy, space, and time—but only certain dynamic configurations (*living biological system entities*) exhibit the phenomenon of life. *Service requires resources*—such as people, technology, information,

organizations—but only certain dynamic configurations (*interacting and changing service system responsible actors*) exhibit the phenomenon of service, applying knowledge to consciously make and keep mutually beneficial promises, guided in part by institutional arrangements. In business and society, the payoff of *service innovation is improved interaction and change processes*—or more simply, new ways of helping others that improve quality of life. The purpose of service innovation is to find new ways that people can apply knowledge for mutual beneficial interactions that improve the quality of life and well-being. The challenge is to also ensure freedom, justice, inclusion, diversity, privacy, and alignment with human values and happiness (which are culturally dependent and evolving) as well as to ensure sustainability and resilience (which are somewhat more objective but also evolving). Like the *agile work practice* that emphasizes *improving improvement processes*, and which is popular in business and government today, most actors are trying to start from where they are and transform into better future versions of themselves (identities and reputations). Like the *positive mindset* for learning and change that is also popular in business and government today, the competition to improve is largely a competition with *oneself* to become that better future self.

Expectations about service change over time. With every passing generation and each new technological era or crisis (e.g., pandemic, war, natural disaster), older types of service are transformed, new types of service appear, and often higher expectations about quality, sustainability, personal safety, and other characteristics of service become the new normal.

No matter how you define it, service exists—and it exists in growing abundance in the human world, fueled in part by AI advances. *Service is worthy of study by scholars (science), worthy of teaching by educators (logic), and worthy of mastery by practitioners who put their unique forms of expertise into practice through business and government structures (architecture)*. Implicit in all definitions are *responsible actors, interactions, and outcomes*—an *evolving ecology* in fact—but we are getting ahead of ourselves.

## The Coming AI Era

This book explores service in the AI era. *AI* is a hot topic these days. Driverless cars, robot surgeons, image recognition, speech recognition, language

translation, and more sophisticated prototypes and more *deployed machine capabilities* are appearing every month. Advances in applying deep learning and increasing availability of large datasets, as well as massive computational resources, make it possible for machines to finally *learn* to perform a range of perception tasks *at or above human-level capabilities*.

While getting AI to near human-like levels across the board is still decades away, eventually AI may enable virtual humans (of a sort) who can be *trusted socially* and *take responsibility for their actions and interactions*. Some believe this is about two generations away (about 40 years, or 2060), while others see it as at least ten generations away or believe it will never happen.

Even if you doubt virtual humans (of any sort) will ever happen, increasing AI capabilities are poised to have a big impact on the application of knowledge for mutual benefits; this fact has great relevance to all three perspectives on service explored in this book. The opportunities and challenges of service in the AI era can be best explored given a basic understanding of AI and *science, logic, and architecture perspectives on service*—hence this book.

### Three Perspectives

This concise book is for a general audience, busy people who are curious about the world, who are outside the service research community. We know there is a lot of interest in the topic of *service in the AI era* from students and professionals working in science, education, business, and government. AI advances depend on machines with *better models of the world*. The *three perspectives* presented in this book also deal with models. First, *models of the world (science)*; second, *models in people's minds (logic)*; and third, *models embedded in organizations' structures and cultures (architecture)*. We are primarily writing for scholars (who help expand useful knowledge), educators (who help the next generation learn), practitioners (who use their expertise to get work done, often as part of organizations). In the body of this book, we keep it concise, and for those who want to go deeper, we provide endnotes and bibliography. We hope each perspective—science, logic, architecture—has something for everyone, especially science for those interested in becoming researchers, logic for everyone who wants to think

differently about service and get better at sharing a powerful way of looking at the world, and architecture for those who want to start a new venture (entrepreneurs) or transform and restructure an existing business department or government agency (enterprise architects, public policymakers).

## Colleagues, Community, and Context

Chances are you are a service professional, working in health care, education, government, retail, hospitality, law enforcement, the military, consulting, caregiving, managing, leading, or some role where you are required to apply knowledge and know-how in a responsible way to help others and keep learning (*upskilling*). At the dawn of this new era in AI, it is a good time for service professionals and the service research community to take stock, broaden access to what is already known, and importantly, re-examine and re-frame what is left to do. There is no shortage of questions and no shortage of opportunities, especially in the *big tent* of disciplines and perspectives of the service community (short for communities of practice). *A community of practice can be defined as a group of people who share common interests or concerns and develop methods of working and learning together to achieve common goals.* In discussions with colleagues at conferences, interest in AI has skyrocketed in recent years. And though service practice and research conferences, journals, and professional associations come in dozens of shapes and sizes, there is always more to do to make the big tent even bigger and more representative of disciplines and cultures needed to navigate service in the AI era.

Words are tools. Education and philosophical foundations are key to building strong communities of practice, dominated by understanding, trust, and value cocreation—service. The International Society of Service Innovation Professional (ISSIP) created two concise book collections with Business Expert Press (BEP) to deepen the readers' understanding of service systems as well as collective intelligence. In this short book, we aim to provide a concise summary of progress so far, along the way strengthening some of the foundations and looking toward future opportunities and challenges. We hope you enjoy it. We hope you find it both accessible for the short term (an easy read that provides a good map of the territory) and handy for the long term (with extensive notes and bibliography if you want to go deeper).

# Introduction

This concise book is written for busy people who are curious about the world around them.

## Interactions and Change

Daily life is full of interactions. For busy people, every hour of the waking day is full of all types of interactions. For busy people who are curious about the world, every interaction is a learning experience. Some interactions have good outcomes for everyone involved, while other interactions have outcomes that are not so good for some stakeholders. We, the authors of this book, are members of a growing community that is trying to learn all we can about these daily interactions of busy people. *Put simply, our goal includes understanding better both the good and bad days.* A better understanding can help people, businesses, and even nations improve interactions, resulting in more good outcomes for everyone's well-being and quality of life. That good feeling of win-win outcomes from our daily interactions is worth a lot to everyone. Not surprisingly, we have learned that *great* interactions create more value for everyone, all the stakeholders gain. Everyone comes away from the interaction a winner in some way. Terrible interactions generate waste in some form, sometimes even the tragedy of wasted human potential. As specialists who often use seemingly complex jargon, our goal in this book is to distill and share the most general and important ideas concisely and with the broadest possible audience of busy, curious people.

What is one of the biggest challenges in trying to improve interactions for everyone? Change. Improving anything requires changing from old ways of thinking and doing to new ways of thinking and doing. Changing habits is often stressful. *Changing habits of mind, the way you think about the world can be especially challenging.* Also, history is full of examples of change that helped some people, while making life much worse for others at the same time. Individuals and groups experience change differently.

For example, younger people and older people may see change very differently. People from different cultures or family backgrounds may see change very differently. People who have spent years making a living for themselves and their families doing a particular type of work in a particular way will surely see change differently if the change negatively impacts their ways of working and providing for their family. Poorly planned change can also have unintended consequences. This is especially true in a world where seemingly everything is connected.

The specialists who spend their days trying to solve this puzzle of understanding and improving daily interactions have a name. They are known as the *service research community*. Thousands of people from around the world do this work, and they have jobs in big companies and small companies, in large and small government agencies, and in universities and nonprofits as well. We could share with you their stories, and the unlikely paths that lead them—including each of us—from other careers to join the *big tent* service research community. After reading this book, we hope some of you may want to join the community as well and adopt some new ways of thinking about interactions and change in your daily lives. *All people have experiences to share about good interactions and good change, as well as bad interactions and bad change.*

What unites our diverse and global service research community is a commitment to better understanding daily interactions and helping people, businesses, and governments change in a way that as much as possible: (1) increases the number of good days, in which busy people experience that win-win well-being feeling from interactions; (2) ensuring the changes help everyone; and (3) all the while avoiding unintended consequences. While many of you may think *STOP* now, and conclude this is an *IMPOSSIBLE* task, remember that there are millions of specialists working on smaller improvements in their corners of the world. Billions of dollars are being invested in smaller improvements. We will return to this concern of the *impossibility* of the task later in this book, but some groundwork must be put in place first.

In the remainder of this introduction, we briefly introduce service and AI with a bit more jargon, which will be explained more fully in later chapters. The intention is to simply give a sense of how service and AI, two jargony terms, are becoming increasingly intertwined. They are

becoming intertwined for the simple reason that a lot of the improvement investments being made by businesses and governments are in new technology innovations to improve service. Every day, more busy people are using smartphones apps and online platforms to get things done. Online platforms have been defined as a digital service or technology-enabled service that enables “interactions between two or more distinct but interdependent sets of users (whether firms or individuals) who interact through the service via the Internet.” In jargon, this is called technology-mediated service interactions—and with robots on the horizon, technology-mediated service interactions are about to go into *monster truck* overdrive.

Businesses and governments are investing heavily to insert more AI into both essential and mundane service offerings, changing the way people interact to get things done in daily life. Change and what not to change is a concern of individuals as well as leaders of businesses and nations. Change brings opportunity, but also brings fears of hazards that need to be better understood. Data-driven, science-based service innovations that drive out cost and sometimes concentrate control continue to shape the new architecture of business and government that provisions service to customers and citizens. *We challenge you to try to think of any service (daily interaction) that is not the subject of improvement investment (change).* Even grabbing a morning coffee and breakfast biscuit at the local drive through is being analyzed for change—all types of routine daily interactions are being studied. Still, there are many questions to be asked by the service research community, and multiple possible answers to be explored. So, let’s begin. This book offers a concise entry point into service in the AI era from three perspectives: science, logic, and architecture. In just a few pages, let’s come to a basic understanding of how simple these really are in essence. Let’s replace any lingering jargon fear with a basic understanding.

## AI Comes to Service

AI is always in the news. It is hard to miss. *By AI, we mean technologies that can act intelligently (like people in some ways) in real-world contexts, whether by learning from data or by being programmed by people or both.* The service research community has always been intensely interested in



technological change. And many have already begun exploring the implications of AI for service from their own perspectives, for example, service robots in retail and hospitality, or the shift in the workforce toward jobs in *the feeling economy*. Yet, questions about AI abound. Mixed in with the basic questions you have come to expect about service (e.g., where is the science? why it is dominant? architecture for what?), on the rise is a steady stream of questions about advancing AI capabilities and the implications for service professionals and the service research community.

Views on AI remain mixed. Some see doom and gloom. Others imagine near utopia with people freed from traditional labor all together. All in all, this diversity of opinion is exactly what you would expect from the *big tent* service community. Communities work together to build ideas. These ideas shape and are shaped by professional practice—the craft of practitioners, scholars, and educators in the professional communities. Terms are borrowed, terms are used, terms are thrown away, new terms are invented, and occasionally, some new terms stick.

## Service Comes to AI

*Trust, responsibility, cocreation, and ethics* are four key terms that are all core to the *big tent* service community but relatively new in the AI community, from an investment and competitive differentiator perspective. As AI enters the adoption stage in business and society, customers and citizens are demanding trusted AI that works well in tandem with people and is demonstrably fair, unbiased, secure, and explainable. Those who develop and deploy AI systems must take responsibility for quality and regulatory compliance of real-world service offerings, not simply the expected productivity gains of innovative laboratory prototypes. Also, when it comes to cocreation with people and machines, ways of interaction are being changed; intelligent augmentation of people and organizations using AI systems is reshaping interactions to mean something new.

The *democratization of AI* means that every economic actor will be paired with an AI capability booster. *The shift to X+AI pairs is to improve X's interaction capabilities*. Therefore, AI is being infused into more and more interactions. For example, during the pandemic, many people used Zoom's AI transcription feature, or automatic meeting notes, to save time

taking notes as well as have an easily searchable record of the conversation. So, start thinking about customer + AI, not just provider + AI. Any AI tool an employer provides an employee to improve productivity may eventually find its way to the customer to use in self-service mode. In fact, platform owners (employer + AI) who are competing with other platforms for both employees and customers may work to align better employee + AI and customer + AI investments as a growth strategy. As *upskilling* people is required for high-skill, high-pay jobs, learners + AI and educators + AI will also be increasingly common, including earning while learning on smartphone apps connected to online platforms, so (l)earner + AI and platform + AI.

Beyond using terms such as trust, responsibility, cocreation, and ethics, another connection point between the service and AI communities is policy implications for skills, jobs, and inclusiveness. Will people + AI *earn and invest more* and become increasingly wealthy? AI-empowered earners in a platform society with responsible platforms helping people earn more and more, as the platform owners are competing for collaborators by expanding both upskilling and earning opportunities—*sometimes abbreviated as (l)earning—both learning and earning*. (L)earning opportunities on responsible platforms help grow the eminence of participants. Others fear AI-empowered businesses and nations exploit people. *Earning and spending that does not increase retirement investing is increasingly seen as an exploitive, poverty trap*. Some predict AI infusion will accelerate winner-take-all dynamics—or at least winner-take-most dynamics, growing the division in society between the haves and the have-nots. Reshaping interactions to provide both for today and tomorrow for all stakeholders is a challenge.

## Growing Connections That Strengthen Both

All of the connections described briefly between the service and AI communities of practice are the result of what people *value most*, not simply the result of technological progress. Human-centered design and human values are becoming a topic of growing importance to scholars, educators, and practitioners (in industry and in government) alike, especially given so many cultural and ideological variations. In recent days, too often, we

hear people say, “I just don’t understand people like ‘them’ and how they think about the world—do you?”

What do we mean by *human values* and *human-centered design*? While not always explicit, the notion of human values and human-centered design pervades all the sections that follow on science, logic, and architecture perspectives. Human values deal with issues of the individual and the collective, wealth and poverty, freedom and security, justice and fairness, inclusion and exploitation, and opportunities to develop greater capabilities and take on more ambitious goals, often called *upskilling*, not just well-being, but well-becoming opportunities. A human-centered design not only improves the experience of the individual human actors directly involved in *interaction and change processes*, but aims to consider implications for all stakeholders as well as potential, longer-term unintended consequences. *Processes are simply ways of getting things done, and a human-centered design aims to improve the ways things get done aligned with human values.*

Is AI like a *bicycle for the mind*, both taking you further than walking and strengthening your muscles in case you need to walk? Or is AI like a *car for the mind*, taking us much further faster, but in the long run, weakening our ability to walk? Also consider that bicycles are more affordable to more people than cars. Bicycles can go more places and require less investment in infrastructure. The point being that depending on human values—those ideas embraced by responsible nations, businesses, and individuals—the future directions of service and AI progress can look profoundly different. In the coming AI era, as AI becomes more capable, and infused in more service offerings, does the use of AI make people stronger or weaker?

In the end, human values come down to questions. What are the individual and collective aspirations that guide people toward a shared future? How do people work together to raise and answer some tough and possibly uncomfortable questions? For example, questions about taking responsibility for building not just a smarter (more efficient and effortless, thoughtless change) world but a wiser (more inclusive and meaningful, thoughtful change) world? How can fear be replaced with understanding? Mere survival, day-to-day living replaced with more meaningful, multi-generational, and sustainable living?

# PART I

## Service in the AI Era

*Civilization advances by extending the number of important operations which we can perform without thinking of them.*

—Alfred North Whitehead, *English Mathematician*

*We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.*

—Roy Amara, *Amará's Law*

*Machines will be capable, within twenty years, of doing any work that a man can do.*

—Herbert A. Simon, 1965, in *The Shape of Automation for Men and Management*

*There was a need to give this field a formal name because work on intelligent machines was done by many individuals and organizations but under different names, that produced friction in knowledge transfer and collaborations.*

—Zizu, 2018, a fictional AI, asking humans about its origins and receiving their responses

*I am putting myself to the fullest possible use, which is all I think that any conscious entity can ever hope to do.*

—HAL 9000 from *2001: A Space Odyssey*.

*For thousands of years, we have known the perils of getting exactly what we wished for. In every story where someone is granted three wishes, the third wish is always to undo the first two wishes.*

—Stuart Russell, 2019, in *Human Compatible: Artificial Intelligence and the Problem of Control*

*We've been waiting decades—maybe even centuries—for the ability to reverse Baumol's Cost Disease in our most service-heavy, yet most critical, industries, such as healthcare... But Baumol himself couldn't have foreseen the revolution that AI is creating...*

—Vijay Pande, general partner at Andreessen Horowitz.

## CHAPTER 1

# Foundations of AI

## Automation and Augmentation

While its roots go back further, as a field of study and community of practice, artificial intelligence (AI) was formally named and began at a Dartmouth, New Hampshire workshop in 1956. From the outset, two camps emerged—those whose primary focus was technology-centric automation (making more capable generations of *thinking* machines) and those focused on human-centric augmentation (making more capable generations of *thinking* people in partnership with machines). The automation camp imagined someday having a machine that imitated a person so well that judges could not tell the difference between machine and human. Meanwhile, the augmentation camp imagined super-professionals solving complex and urgent problems beyond the reach of the best minds of the day. Both camps had utopian advocates and dystopian critics, while the reality was slow and steady progress, punctuated with so-called *AI winters* of waning interest and investment, and *AI summers* of increased enthusiasm and investment. Progress in deep learning is the cause of the current AI summer. Deep learning requires huge datasets and massive amounts of computing power to solve a math problem and build better AI.

As both agriculture and manufacturing were mechanized and scaled in the 1800s and 1900s, the automation AI camp envisioned scaling access to complex, knowledge-intensive service, increasing access to the capabilities provided by doctors, teachers, musicians, actors, lawyers, and someday perhaps even those in political offices. Meanwhile, the augmentation AI camp envisioned empowering human professionals, allowing them to solve previously unsolvable complex and urgent problems for science, business, and society. AI can be used to improve productivity by

replacing labor with technology to get routine service work done more quickly and cheaply, and AI can be used to improve quality and creativity by augmenting the performance of people who care about quality and innovation.

In short, like two sides of the same coin, both automation and augmentation can lead to better AI and better service. This better service viewpoint may provide a more integrated view of these two AI camps. Both camps offer better scaling of service. In later sections, we also explore what the service community of practice has to offer the AI community of practice. In the next section, we explore the reality of service robots (automation) and service platforms (augmentation). Service robots go beyond self-service technologies (SSTs) into the realm of super-service. Service platforms empower superior performance and super-professionals. As we argue, platforms can empower customer self-service or can be used by employees or partners to augment their professional service-providing capabilities.

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**Markus Warg** is a Professor for Leadership, Service Design and Risk Management at University of Applied Sciences Wedel/Hamburg. In 2015 he published the *Service Dominant Architecture (SDA)*.

Service Systems and Innovations for Business and Society Collection

Jim Spohrer and Haluk Demirkan, *Editors*

