# Preface

My original intent was only to write a different kind of a scientific book about service: not one about marketing service *per se*, or service operations, or consulting; but one offering an interdisciplinary explanation to why service matters and how we can help. But in the end, writing the book has become a journey of its own. Like an actor getting carried away by his role, I got convinced by my investigation that service matters a whole lot more. I started to try to explain that we are already in a service-led revolution which is not just post-industrial revolution, but also post knowledge economy for further fundamental transformation. I put the explanation in a new ***theory of service scaling and transformation: digital connections scaling*** (***DCS***). This is the book.

In this book, I attempt to ask, and then answer: What is the big story about service? What are the grand research problems in service? What does "a connected world" mean? Does service require a different kind of design science? What will be the next waves of the Web? How to make enterprise information systems adequate for service scaling? How to unite cyberspace with physical space? Is it feasible to massively connect independent information resources everywhere? Is a service-led revolution reality or gimmick? Each question and answer becomes a chapter of the book, which, hopefully, adds to a new service science.

I must admit that the notion of a new service science itself can be controversial (discussed in Chapter 1). However, I am a believer. I base my work largely on the visions of the Cambridge Papers 2008, but

with my own particular convictions. I believe the scientific field has major holes awaiting a new service science to bridge them. The situation is not unlike what management science faced in the 1950s and computer science in the 1960s. A counter-example is information technology of the 1990s, which is a would-be field that failed to materialize scientifically. If a new service science is to be realized, it has to be interdisciplinary and integrative, as opposed to merely being multi-disciplinary. It has to possess certain defining properties that not only distinguish the field but more importantly unify past results for new expansions powered by its own new paradigms.

For example, I believe a new population orientation paradigm has arisen in scientific research for the digitally connected world. The emerging networks science and Web science, and their applications in traditional fields such as information systems, are all evidence. Such a paradigm studies directly the population knowledge (laws and probabilities) rather than the inference of them through samples (laboratory prototypes and statistics). It promises to cure the "theory-rich but data-poor" dilemma observed of new service research. The reason for pursuing the population is simple: we are now able to do it. Is it not always the population that matters? The situation is not unlike what astronomy had experienced before the advent of massive continuous observation data from arrays of space-borne probes, radio telescopes, and other large-scale observatories.

In this regard, I am actually a latecomer: someone who has just been converted. I used to rely on none other than laboratory prototyping to prove my concepts throughout my academic career. However, now I see why William W. Cooper and other pioneers insisted on building comprehensive empirical data sets about company practices for economic sciences. Service science may be in even more peculiar need of this population orientation since service is one of a kind ***cocreation*** between the customer and the provider of value. The provider wants to scale up, down, or transform the customer pools to gain benefits of scale (e.g., marginal cost, productivity, and complementary value propositions) and reduce the learning curve to do "mass customization". The customer wants to scale up, down, or transform the provider pools to gain benefits of scale

(e.g., competition, choices, and quality) and reduce transaction costs and cycle times for their life cycle tasks. The society wants to scale up, down, or transform both pools for all persons and organizations to gain benefits of scale (e.g., unity of interests, synergism of resources, and ease of change) and enhance sustainability, advancement, and control. Only the population (of value propositions, systems, resources, as well as persons and organizations) can represent all the pools. Only the population can define and provide sufficient scientific knowledge for such cocreation. And, now ***the population can be reached with digital connections scaling***. Indeed, ***population-oriented cocreation*** is the mantra of this book.

Clearly, I need to be broad in my perspective while striving to be concrete and specific in developing an answer to the questions I raised above. The writing journey has proven to be both challenging and rewarding. I have established a ***design*** theme for the new theory: the DCS model is substantiated with design methods for macro- to micro-innovation, industrial applications (e.g., smart highways and information supply chains), and a new class of microeconomic production functions to explain the paths of transformation. To help anchor its relevancy, this book has also embarked on analyses of new business designs emerging on the Web since the advent of e-commerce/e-business, and projected the findings onto their next waves. These interdisciplinary results have invoked microeconomics and the science of networks as their conceptual foundations, and encompassed systems planning and design at the level of business strategy, enterprise engineering, and information and database systems. Empirical examples as well as scientific literature are employed to justify the concepts developed.

I wish to share that I was surprised by some of the results from my investigation: Certain visions can be logically inferred for a future knowledge economy (Chapter 1). A cohesive set of "grand research problems" falls into place rather naturally when following an interdisciplinary interpretation of a new service science (Chapter 2). The DCS model seems to suggest a new small world phenomenon if role-based hyper-networks are recognized (Chapter 3). A modelbase may help reduce learning curves for service system designers (Chapter 4).

Next waves of new business designs may arise from synthesizing social networks and business in a pursuit of life cycle tasks integration (Chapter 5). New classes of service cocreation enterprise information systems may be designed from embedding them into societal cyber-infrastructure (Chapter 6). The environment — especially the infrastructure — may be instrumented and unified with cyberspace in a thought model similar to databases (Chapter 7). A market design may help massively distributed independent information resources collaborate for massive value cocreation (Chapter 8). And, finally, a new mode of production based on cocreation may permeate both service and non-service activities characterized by new classes of production functions (Chapter 9).

My work reflects a working definition of what I envision as interdisciplinary research for a new service science. The first three chapters constitute the basis of the book. The remaining chapters deepen the theory of service scaling and transformation in technical aspects. For readers who are particularly interested in information systems and database theory, Chapters 6 and 8 respectively may be of some immediate value since they extend certain proven results in these fields. In a similar way, management science and industrial/systems engineering students may find Chapter 4 immediately relevant; business strategy students, Chapter 5; intelligent transportation and global logistics students, Chapter 7; and microeconomics students, Chapter 9. I would be extremely flattered if the readers would care to scrutinize and verify these claims.

As is true for every scientific endeavor, I have benefited tremendously from previous results contributed by numerous colleagues in the field. I only have a limited capacity to cite them in this book. On a personal level, I have received indispensable support from many colleagues, without which my work would be impossible. I wish to recognize foremost Dr. James C. Spohrer, Director of Service Research at IBM Almaden Center. I had intensive discussions with Jim during my investigation for the book, and have benefited from his generous comments. He inspired, in particular, my work on formulating the research problems of Chapter 2, and advised me on the DCS model of Chapter 3. In fact, the phrase: digital connections scaling, is attributable

to Jim to whom I owe my sincere gratitude. I am also indebted to Dr. John E. Kelly, III, Senior Vice-President for Research at IBM, for his encouragement of my research on service. Closer to home, I wish to express my deep admiration as well as appreciation of a long-time colleague, Dr. Daniel Berg, Institute Professor at Rensselaer. Dan is one of the pioneering researchers and educators in the field who have been advocating service science long before I came to realize its profound scientific meaning and promises. Dan continues relentlessly to champion the field and to provide inspiration and support to many, including myself. Many other colleagues at Rensselaer and elsewhere have also inspired me, especially Dr. James M. Tien, another long-time colleague who has developed seminal analyses on service systems engineering. Finally, I wish to thank wholeheartedly my colleagues, Drs. Gilbert Babin, Christopher D. Carothers, W. K. Victor Chan, Ananth Krishnamurthy, David M. Levermore, William A. Wallace and Thomas R. Willemain, who have provided invaluable comments on some of my earlier works leading to this book. It has always been an honor to work with them.

*Cheng K. Hsu*