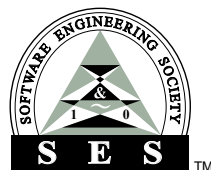


Preface



No book is the sole product of its authors. There are always supporting and facilitating individuals who deserve major credit. If a book is composed of an integrated set of chapters aimed at conveying a single focus, the number of contributing individuals is significantly increased. Therefore, we would like to thank all contributing authors for their dedication and patience, and in some cases, enduring multiple edits and revisions to maintain a common format and seamless presentation. Without their dedication and hard work this book would not have been completed. A special thanks goes to one of the editors, Dr. Varadraj P. Gurupur, who conceived the idea and mobilized us as well as many of the contributors. As key next generation leader, Dr. Sang C. Suh negotiated the contract and played a significant supporting role throughout the process. We also extend our thanks to Society for Design and Process Science (SDPS: www.sdpsnet.org). Many of the authors are members of SDPS and had presented some of the materials in these chapters at prior SDPS conferences. Therefore, we would like to offer our sincere gratitude to all of you; the chapter contributors, Springer editors, numerous reviewers, and the SDPS Board of Directors. More importantly, we extend our gratitude to the SDPS family and friends, who are the main force and energy behind all our community oriented efforts.

The planning for this book germinated during the SDPS-2010 conference when we invited the SDPS family and friends to attend the Society's 15th Anniversary celebration in Dallas, Texas. Friday, June 11, 2010, the last day of the conference, was completely dedicated to the Next Generation activities. The day started with the Next Generation Keynote Address of Dr. Aditya Mathur, Department Head of Computer Science at Purdue University. The next was an informal panel of our distinguished seniors: Dr. C.V.Ramamoorthy and Dr. Oktay Sinanoglu and others who offer guidance and inspiration to next generation participants. This event immediately followed with panel participants from the next generation, namely Dr. Hironori Washizaki, Dr. Herwig Unger's representative, Dr. Yong Zeng, Dr. John N. Carbone, Dr. Sang Suh, Dr. Ali Dogru, Dr. Radmila Juric, Dr. Fan Yang, and Dr. Peng Han. All these interactions are characteristic of the traditional openness and sincerity of past SDPS conferences but with a goal to develop ideas for the next generation. The afternoon began with Jim Brazell, President, Ventureramp, Inc., who conducted the Next Generation Facilitation Workshop. During this workshop many

ideas for the future of SDPS were extended. Dr. Gurupur suggested the idea of this book and followed through with the support of Dr. Suh to complete the project. You are holding in your hands the fruits of a year-long effort of hard work and dedicated concentration. This book represents the first volume of a series of volumes to be produced on many topics concerning transformative integration—a subject dear to the SDPS family, friends, and supporters. Therefore, we wish to diverge a moment to present a short history of SDPS in this first volume.

HISTORY AND THE FUTURE

Let's start with a recollection of how SDPS vision has started. During the summer of 1989 Dr. Tanik and Dr. Bernd Krämer met at Naval Postgraduate School, where Dr. Richard Hamming, a founder of coding theory provided intellectual support for *The Mathematical Foundations for Abstract Design* book Dr. Tanik was working on. The book eventually got published in 1991 under the name Fundamentals of Computing for Software Engineers. During the 1994 Systems Integration Conference in Brazil organized by one of the founders of SDPS Dr. Fuad Sobrinho, fate brought together Dr. David Gibson and Dr. Tanik. They had just arrived at the airport and were waiting for the conference bus. They did not know each other but Dr. Tanik initiated a conversation and started to expound the plans for establishing a new society which had emerged from a small group earlier that summer. This new society he described would focus on transdisciplinary science. An early version of the star-shaped logo was already designed. Fundamental nature of process was suggested by Dr. R. T. Yeh and the name "Abstract Design and Process" was in the works. Dr. Gibson informed Dr. Tanik that he should visit with Dr. George Kozmetsky and explain these ideas to him upon their return. Eventually, Dr. Gibson, Dr. Kozmetsky, and Dr. Tanik met at IC²Institute in Austin. The beginnings of SDPS were already taking shape at that time, including the original name, original star-shaped logo, bylaws, and basic concepts. The logo represents information integration through communication. Little did Dr. Tanik know, but both he and Dr. Kozmetsky had a mutual friend, Dr. C.V. Ramamoorthy. After some discussions during that first meeting, Dr. Kozmetsky said, "Tell Ram to call me," indicating Dr. C.V. Ramamoorthy. It was this connection along with the support of many people that triggered the launch of SDPS. The first SDPS conference was held in December, 1995 at the IC² facilities in Austin and Dr. Tanik, at that time was a member of the Department of Electrical and Computer Engineering under the chairmanship of Dr. Steven Szygenda. Eventually, SDPS was established by the founding board, composed of late Dr. Kozmetsky (chairman), Dr. C. V. Ramamoorthy, Dr. R. T. Yeh, Dr. A. Ertas, and Dr. M. Tanik. SDPS was incorporated in the State of Texas on September 6, 1995 as a non-profit organization and Dr. R. T. Yeh was elected as the first and founding president of SDPS. The current Society for Design and Process Science (SDPS) board is composed of Dr. C. V. Ramamoorthy, Dr. R. T. Yeh (honorary member), and Dr. B. Krämer, and Dr. M. Tanik.

The second impetus for furthering the transformative vision of SDPS happened in the year 2000. During SDPS-2000 Keynote Speech, Dr. Herbert A. Simon is quoted as saying:

...Today, complexity is a word that is much in fashion. We have learned very well that many of the systems that we are trying to deal with in our contemporary science and engineering are very complex indeed. They are so complex that it is not obvious that the powerful tricks and procedures that served us for four centuries or more in the development of modern science and engineering will enable us to understand and deal with them. We are learning that we need a science of complex systems, and we are beginning to construct it...

With this direction and our accumulated experience, the SDPS governing board in 2000 established the Software Engineering Society (SES) and a publishing arm of SDPS. Neither SES nor the publishing arm of SDPS fully served their intended purposes partly due to our self-reliant attitudes. Eventually, our publishing arm split to a smaller entity at the end of 2008 by a SDPS board decision. As we completed our fifteen years, it is time to rededicate ourselves to the notion of worldwide, sustainable, and transformative goals of SDPS and SES. This is where we need the energy, creativity, and high aspirations of the next generation. Furthermore, SDPS should play a leading role in the development of the processes for next generation transformative knowledge dissemination. The time for knowledge dissemination with classical book methods and traditional journal publications is passing. The next generation would play a critically leading role in this arena with new dissemination initiatives. This edited volume is a small step in this direction.

In the year 2000, then SDPS President, Dr. Tanik, delivered the following message in his opening address:

During the last five years, SDPS greatly enjoyed your support and intellectual participation. What makes SDPS successful is the combination of all your individual efforts and participation. That means SDPS is really YOU...nothing more nothing less. SDPS = YOU. Actually for us, YOU is also an acronym that stands for Young-Organized-Unspoiled. In other words, SDPS is Young and does not carry the burden of old societies. SDPS is organized worldwide with truly international and dedicated members. SDPS is Unspoiled, meaning pure, refreshing, sparkling, uncontaminated, and whole. We are now ready to expand our organization, as we stand poised to make a great impact in the new millennium. Hence, the collective knowledge and intellectual energy each of YOU contribute at every conference is the driving force behind the ascent of SDPS.

SDPS stayed the course for another decade and persevered, but it is now time to advance to new horizons. We have carried the light of Dr. Kozmetsky, who had established one of the first, if not the first, comprehensive and practical transdisciplinary center complete with an educational component: IC² Institute. Dr. Kozmetsky also provided a direction for expansion of SDPS fifteen year ago. In his address published in Transactions of SDPS Vol-1 No-1 (1996) he emphasized that

...We need to develop a step-by-step generational road map that sets forth the opportunities to commercialize our scientific and technological breakthroughs as well as their timing. Equally important, the road map must set forth the commercialization process including their global initiatives.

On this vision, we now recognize that the time has come for us to actively seek collaboration from our colleagues in many disciplines in order to implement our goals. Along these lines, thanks to the founding leaders of SDPS such as Nobel Laureate Dr. Herbert A. Simon, distinguished professors Dr. C.V. Ramamoorthy and Dr. R. T. Yeh, as well as dedicated worldwide membership, including various other Nobel Laureates such as Dr. Ilya Prigogine and Dr. Steven Weinberg, we are extending the vision of integration of business, engineering, and science processes towards transformative goals. Again this book provides a first small step towards these goals for the next generation.

The book composed of twenty two chapters organized in two sections. The focus of first section composed of twelve chapters is medical processes. These include: Medical Devices Design Based on EBD: A Case Study; The Great Migration: Information Content to Knowledge Using Cognition Based Frameworks; Design and Process Development for Smart Phone Medication Dosing Support System and Educational Platform in HIV/AIDS-TB Programs in Zambia; Image-Based Methodologies and their Integration in a Cyber-Physical System for Minimally Invasive and Robotic Cardiac Surgeries; Implementing a Transdisciplinary Education and Research Program; JIGDFS: A Secure Distributed File System for Medical Image Archiving; Semantic Management of the Submission Process for Medicinal Products Authorization; Sharing Healthcare Data by Manipulating Ontological Individuals; Sharing Cancer Related Genes Research Resources on Peer-to-Peer Network; IHCREAD: An automatic Immunohistochemistry Image Analysis Tool; A Systematic Gene Expression Explorer Tool for Multiple and Paired Chips; and On Solving Some Heterogeneous Problems of Healthcare Information Sharing and Interoperability Using Ontology Computing. The focus of the second section composed of eleven chapters is techniques and technologies. These include: Clinical Applications and Data Mining; Image Processing Techniques in Biomedical Engineering; Probabilistic Techniques in Bioengineering; A Complete Electrocardiogram (ECG) Methodology for Assessment of Chronic Stress in Unemployment; Coherence of Gait and Mental Workload; Efficient Design of LDPC Code for Wireless Sensor Network; Toward Multi-Service Electronic Medical Records Structure; The New Hybrid Method for Classification of Patients by Gene Expression Profiling; New Musculoskeletal Joint Modeling Paradigms; and The Role of Social Computing for Health Services Support.

The National Institutes of Health (NIH) states that a transformative research project is based on creative ideas and projects that have the potential to transform a field of science. This has also been the goal of SDPS since the beginning by following Dr. Simon's lead in integrative research on complex systems and unstructured problems. The current motto of SDPS, *Transformative research and education through transdisciplinary means*, is in line with the NIH and National Science Foundation (NSF) goals on transformative initiatives. We sincerely hope that this book will trigger the series of edited manuscripts lead by next generation SDPS leadership. The contributions by many authors from different disciplines will serve the goals of transformative research and education for the benefit of and civilizing effect on society.



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