

# Preface

Design is ubiquitous, yet universal; it pervades all spheres of life, and has been around ever since life has been engaged in, purposefully changing the world around it. While some designs that matured many centuries ago still remain in vogue, there are areas in which new designs are being evolved almost every day, if not, every hour, globally. Research into design and the emergence of a research community in this area has been relatively new, its development influenced by the multiple facets of design (human, artefact, process, organisation, and the micro- and macro-economy by which design is shaped) and the associated diversification of the community into those focusing on various aspects of these individual facets, in various applications. Design is complex, balancing the needs of multiple stakeholders, and requiring a multitude of areas of knowledge to be utilised, with resources spread across space and time.

The collection of papers in this book constitutes the Proceedings of the 4th International Conference on Research into Design (ICoRD'13) held at the Indian Institute of Technology Madras in the city of Chennai, India during 7–9 January 2013. ICoRD'13 is the fourth in a series of biennial conferences held in India to bring together the international community from diverse areas of design practice, teaching and research. The goal is to share cutting edge research about design among its stakeholders; aid the ongoing process of developing a collective vision through emerging research challenges and questions; and provide a platform for interaction, collaboration and development of the community in order for it to address the challenges and realise the collective vision. The conference is intended for all stakeholders of design, and in particular for its practitioners, researchers, teachers and students.

Out of the 201 abstracts submitted to ICoRD'13, 175 were selected for full paper submission. One hundred and thirty-two full papers were submitted, which were reviewed by experts from the ICoRD'13 International Programme Committee comprising 163 members from 127 institutions or organisations from 32 countries spanning five continents. Finally, 114 full papers, authored by over 200 researchers from 91 institutions and organisations from 23 countries spanning five continents, have been selected for presentation at the conference and for

publication as chapters in this book. ICoRD has steadily grown over the last three editions, from a humble beginning in 2006 with 30 papers and 60 participants, through 75 papers and 100 participants in ICoRD'09, and 100 papers and 150 participants in ICoRD'11. This is also the first time that ICoRD has taken place outside Bangalore, with the Indian Institute of Technology Madras and Indian Institute of Science Bangalore jointly sharing the responsibility for its organisation.

The chapters in this book together cover all three major areas of products and processes: functionality, form and human factors. The spectrum of topics range from those focusing on early stages such as creativity and synthesis, through those that are primarily considered in specific stages of the product life cycle, such as safety, reliability or manufacturability, to those that are relevant across the whole product life cycle, such as collaboration, communication, design management, knowledge management, cost, environment and product life cycle management. Issues of delivery of research into design, in terms of its two major arms: design education and practice, are both highlighted in the chapters in this book. Foundational topics such as the nature of design theory and research methodology are also major areas of focus. It is particularly encouraging to see in the chapters the variety of areas of application of research into design—aerospace, healthcare, automotive and white goods sectors are but a few of those explored. The theme of this year's conference is Global Product Development. The large number of chapters that impinge on this theme reflects the importance of this theme within design research.

On behalf of the Patron, Steering Committee, Advisory Committee, Local Organising Committee and Co-Chairs, we thank all the authors, reviewers, institutions and organisations that participated in the conference and the Conference Programme Committee for their support in organising ICoRD'13 and putting this book together. We are thankful to the Design Society and Design Research Society for their kind endorsement of ICoRD'13. We thank the Indian Institute of Technology Madras and the Indian Institute of Science, Bangalore for their support of this event. We also wish to place on record and acknowledge the enormous support provided by Mr. Ranjan B. S. C., Ms. Kumari M. C. and Ms. Chaitra of IISc in managing the review process, and in preparation of the conference programme and this book, and the group of student-volunteers of Indian Institute of Technology Madras led by Swostik, Suraj and Sahaj in the organisation and running of the conference. Finally, we thank Springer India for its support in the publication of this book.

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ICoRD'13

Global Product Development

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2013, XLVIII, 1448 p. In 2 volumes, not available separately., Hardcover

ISBN: 978-81-322-1049-8