

# Preface

This volume set is a collection of the peer reviewed papers from the 3<sup>rd</sup> International Conference on Advances in Product Development and Reliability (PDR'2012), held during July 28-30, 2012, Wuhan, China. This conference series addresses the scientific and technological issues underlying increases in performance, reliability and life. Its remit embraces design and manufacturing aspects of product development and reliability, as well as operational life prediction and extension.

The development of innovative, reliable and material-efficient products is crucial to the survival and prosperity of modern corporations and societies in the increasingly integrated global economy. New methodologies, technologies and tools for product development and reliability are under active investigation, with especial attention focused on systemic, integrated and lifecycle perspectives. Alongside this, new materials with enhanced properties are being developed and the concept of intelligent structures is gaining ground. The attributes of such structures range across self-detection of damage to optimized material combination, properties and geometries that reflect multivariate design requirements at various positions and interfaces in the structure or product. PDR'2012 provided an international forum for academia and design, development and reliability practitioners to report and exchange leading-edge scientific knowledge and industrial experience in these areas.

The conference had a broad remit and focused on the development and reliability of consumer products as well as integrity, reliability and operation of engineering structures and systems. The conference papers cover several topics such as product development methodology; sustainable and green product development; system reliability; design optimization; reliability methodology and tools in design and manufacturing; collaboration theories and methodologies in product development; innovative product development processes and tools; product-service- systems; virtual and digital product development technique; product lifecycle management; structural reliability, safety, and integrity; supply chain management for product development; product operational reliability; product development policy and regulation; education and training in product development and reliability.

Delegates from academia, government and non-governmental organizations, research institutes and companies attended the conference and presented papers on the latest developments in research and application related to these areas.

The editors would like to express their deepest appreciation to professor P.G. Li, professor B.C. Wen, professor Z.T. Gao and professor Z.Y. Shen, the Honorary Advisory Committee and to the Scientific Committee for their help and support that were essential for making the conference a success. Special thanks are also due to members of the Conference Secretariat.

We would also like to thank the Organizing Institution, Huazhong University of Science and Technology and the Co-Sponsors, the National Natural Science Foundation of China (NSFC), the European Structural Integrity Society (ESIS), and State Key Lab of Digital Manufacturing Equipment & Technology, who supported the PDR'2012 conference in different ways.

Editors

L. Gao, W.D. Li, Y.X. Zhao, X.Y. Li

**2012 International Conference on Advances in  
Product Development and Reliability (PDR'2012)  
28<sup>th</sup>-30<sup>th</sup> July, 2012, Wuhan, China  
<http://pdr2012.hust.edu.cn>**

**Edited by**

L. Gao, W.D. Li, Y.X. Zhao, X.Y. Li

**Organizer**

Huazhong University of Science and Technology, China

**Co-sponsors**

European Structural Integrity Society

National Natural Science Foundation of China

State Key Lab of Digital Manufacturing Equipment & Technology

**Honorary Chairs:**

**P.G. Li**, Academician of CAE, Huazhong University of Science and Technology, China

**B.C. Wen**, Academician of CAS, Northeastern University, China

**Z.T. Gao**, Academician of CAS, University of Aeronautics & Astronautics, China

**Z.Y. Shen**, Academicians of CAE and CAS, Southwest Jiaotong University, China

**General Chairs:**

**X.Y. Shao**, Huazhong University of Science and Technology, China

**L. Gao**, Huazhong University of Science and Technology, China

**M.N. James**, University of Plymouth, UK

**Program Committee**

**Chairs**

**W.D. Li**, Coventry University, UK

**Y.X. Zhao**, Southwest Jiaotong University, China

**X.Y. Shao**, Huazhong University of Science and Technology, China

**L. Gao**, Huazhong University of Science and Technology, China

**Members**

**W.H. Chen**, Zhejiang Sci-Tech University, China

**L. Ding**, University of Bath, UK

**Y.D. Gong**, Northeastern University, China

**Z.Y. Jia**, Dalian University of Science and Technology, China

**Z.L. Gao**, Zhejiang University of Technology, China

**S. Ishihara**, Toyama University, Japan

**Y.C. Liang**, Harbin Institute of Technology, China

**Y.S. Ma**, University of Alberta, Canada

**J. Matthews**, University of Bath, UK

**P.S. Pa**, National Taipei University of Education, Taiwan, China

**E.D. Ramón-Raygoza**, Dirección de administración y desarrollo de tecnología central Vitro, México

**H.J. Shi**, Tsinghua University, China

**S.J. Wang**, Shenyang University of Technology, China

**R.H. Tan**, Hebei University of Technology, China

**D.B. Tang**, Nanjing University of Aeronautics & Astronautics, China

**D.Y. Xue**, University of Calgary, Canada

**W.X. Yao**, Nanjing University of Aeronautics and Astronautics, China

**J. Zhang**, Beijing University of Science and Technology, China  
**Y.M. Zhang**, Northeastern University, China  
**W.Z. Zhao**, Dalian Jiaotong University, China  
**Z.D. Zhao**, Inha University, Korea  
**W. Ijomah**, University of Strathclyde, UK  
**J. Windmill**, University of Strathclyde, UK  
**Y. Xu**, Cranfield University, UK  
**J. Mehnen**, Cranfield University, UK  
**V. Shatokha**, National Metallurgical Academy of Ukraine, Ukraine  
**A. Giret**, Universidad Politecnica de Valencia, Spain  
**K.-M. Chao**, Coventry University, UK  
**X. Fei**, Coventry University, UK  
**B. Song**, Singapore Institute of Manufacturing Technology, Singapore  
**K. Liu**, Singapore Institute of Manufacturing Technology, Singapore  
**Y. Liu**, National University of Singapore, Singapore  
**Y. Zeng**, Concordia University, Canada  
**L.H. Wang**, University of Skövde, Sweden  
**S. Stan**, Technical University of Cluj-Napoca, Romania

#### **Secretaries in General**

**W.D. Li**, Coventry University, UK  
**X.Y. Li**, Huazhong University of Science and Technology, China

#### **Local Executive Committee**

Chair: **L. Gao**, Huazhong University of Science and Technology, China  
Secretary: **X.Y. Li, P. Jiang**, Huazhong University of Science and Technology, China  
Publication manager: **X.Y. Li**, Huazhong University of Science and Technology, China  
Financial manager: **P. Jiang**, Huazhong University of Science and Technology, China