The First International Conference on Construction Information Technology

INNOVATIVE APPLICATION OF INFORMATION TECHNOLOGY IN CONSTRUCTION

Aug 15-17 2004, Beijing, China

Edited by

Xuehui An
Zhiliang Ma
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内 容 简 介

The First International Conference on Construction Information Technology was held in Beijing, China, from 15th to 17th August 2004. This volume contains 64 papers on the general topic of Construction Information Technology. Four topics include: Strategies for development of construction information Technology. Development and application of information systems, Supportive technologies for construction information technology, Application of finite element method and simulation technology.

图书在版编目（CIP）数据

信息技术在建设领域中的创新应用：第一届建设领域信息化国际会议论文集=Innovative Application of Information Technology in Construction：英文/安雪晖等主编.—北京：清华大学出版社，2004.8

ISBN 7-302-09197-8

Ⅰ.信… Ⅱ.安… Ⅲ.信息技术-应用-基本建设-世界-国际学术会议-文集-英文 Ⅳ.F28-39

中国版本图书馆 CIP 数据核字（2004）第 080577 号

出 版 者：清华大学出版社　　**地　　址**：北京清华大学学研大厦

http://www.tup.com.cn　　**邮　　编**：100084

社 总 机：010-62770175　　**客户服务**：010-62776969

责任编辑：汪亚丁

封面设计：常雪影

印 刷 者：北京中科印刷有限公司

装 订 者：三河市金元装订厂

发 行 者：新华书店总店北京发行所

开　　本：203×280　**印张**：32.75　**字数**：700 千字

版　　次：2004 年 8 月第 1 版　2004 年 8 月第 1 次印刷

书　　号：ISBN 7-302-09197-8/TU・229

印　　数：1~700

定　　价：198.00 元

The First International Conference on Construction Information Technology

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Preface

The First International Conference on Construction IT has been organized by the School of Civil Engineering, Tsinghua University, and held in Beijing from August 15 to August 17, 2004. The conference aims to provide an international forum for scientists, researchers, engineers, and other professionals to present and discuss recent research and advances in Construction IT, i.e. construction information technology.

Construction industry is a traditional industry and it is gaining livingness with the introduction of information technology. As a supportive industry, it is affecting a very large range of social life so that small improvement on it can cause large benefits. This is especially true to the current construction industry in China, where the largest scale of construction is undertaken in the world. The Chinese professionals are open to the rest of the world to take in advanced technologies including Construction IT; as well as they are eager to share their experience with the people in this profession in the world. This conference is a very good opportunity for the delegates of both Chinese and abroad to this end towards making innovative progress on Construction IT.

The proceedings contain 64 papers including two invited paper and 13 keynote papers. These papers are categorized into four aspects, i.e. strategies for development of construction information technology, development and application of information systems, supportive technologies for construction information technology, and application of finite element method and simulation technology, with 17, 18, 12 and 17 papers in each aspect respectively.

The conference has also been in cooperation with the committee for the national 10^{th}-five-year research project "Stratagems and Policy on Development of Digital City Project", which is subordinated to the initiative of "Application of Information Technology in Chinese Cities' Planning, Construction, Management and Services".

The organization of the conference would not have been possible without the support and contributions of many individuals and organizations. We sincerely appreciate the support from the Department of Science and Technology and Department of Construction Quality, Safety Supervision and Construction Industry Development, Chinese Ministry of Construction; the Information Center of the Chinese Ministry of Construction; Dept. of International Cooperation and Science and Technology, Chinese Ministry of Water Resources; China Three Gorges Project Corporation; Chinese Society of Civil Engineering; Chinese Hydraulic Engineering Society; Japan Construction Information Center (JACIC); Service Center of Port Engineering (SCOPE); Japan Society of Civil Engineering (JSCE); Department of Civil Engineering, University of Tokyo; and Faculty of Construction and Land Use, Hong Kong Polytechnic University, Hong Kong. We also wish to express our gratitude to all the contributors for their careful presentation of the manuscripts. We also greatly appreciate the support from our sponsors, Autodesk Co., Ltd. and Forum 8 Co., Ltd., Maeda Corporation, Tsinghua Sware Software Hi-Tech Co. Ltd., Thanks are also due to those who devoted time and effort to the organization of the conference and the publication of the proceedings, including the secretarial staff and research students of the school.

Finally, we gratefully acknowledge our pleasant cooperation with Ms Yading Wang in the publishing the proceedings.

Xuehui An
Zhiliang Ma

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Part II Development and Application of Information Systems

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Part I Strategies for Development of Construction Information Technology

Application of Information Technology in the Field of Public Works-Information of JACIC Activities

Toyoda T.[1]
[1]Construction Information Center, Japan

1 Introduction: Overview of Japan

1.1 Topography and Climate

Situated off the east coast of the Asian continent, Japan consists of a crescent-shaped archipelago of approximately 377,900 km^2 that runs virtually parallel to the continental coastline with the Sea of Japan in between and is elongated north-to-south. Sixty-one percent of the national land is mountainous and the country has as many as 13,935 first-class rivers (total extension: approximately 87,400 km). Due to the large number of many bays and capes, the coastlines are complicated with various curves and extend for approximately 34,600 km in total. In addition, the Japanese archipelago has the world's most complicated geography with a number of plates overlapping each other, which makes Japan one of the most earthquake-prone countries in the world.

The Japanese climate is largely temperate with clearly defined four seasons. The country, which is stretched north-to-south and has many mountain ranges running through the archipelago, exhibits various types of weather. On the Pacific Ocean side, summer is mostly hot and humid due to the southeast seasonal wind and winder is characterized by successions of dry and sunny days. In contrast, the Sea of Japan side experience relatively comfortable summer with lower temperature but often has heavy snow in winter because of the cold air driven by the northwest seasonal wind. Moreover, all regions except Hokkaido go through the rainy season from June to July and typhoons hit the country, especially southern Kyushu and southern Shikoku, in August and September.

1.2 National State

The population of Japan is about 126,100,000 (2004), 22.4 percent of which is concentrated in large city areas. The population accounts for 2.1 percent of the global population.

Per capita energy consumption is on a level with that of European countries and equivalent to 4.1 t of oil per person (2003). The GDP is about 565 trillion yen (preliminary figures for January to March, 2004 for real GDP).

1.3 Infrastructure Development

Table 4 shows the status of major infrastructure development in Japan.

Table 1 Percentages of national populations in global population (2001)

Country	Percentage	Country	Percentage
China	20.9	Russia	2.4
India	16.7	Bangladesh	2.3
U.S.	4.7	Japan	2.1
Indonesia	3.5	Nigeria	1.9
Brazil	2.8	Mexico	1.6
Pakistan	2.4		

(Source: U.N. Population Div.)

Table 2 Per capita energy consumption (2003)

Country	Per capita energy consumption (equiv. to per capita oil consumption in tons)
U.S.	8.2
Canada	8.2
France	4.4
Russia	4.2
Japan	4.1
Germany	4.1
South Korea	4.1
U.K.	3.9
China	0.7
India	0.3

(Sources: BP Statistics 2003, Statistical Handbook of Japan 2003)

Table 3 International real GDP comparison (1998)

Country/Region	Real GDP (in bil. dollars)	Country/Region	Real GDP (in bil. dollars)
U.S.	6,958	South Asia 5	2,164
EU 15	6,624	ASEAN 4	1,295
China	4,120	Mid./East Europe 6	1,161
Japan	2,515	Africa 10	612
Latin America 7	2,373		

*Real GDP: purchasing power parity (PPP) for 1990)

(Source: CRIEPI report "Growth Potential of Asian Economy" by Norihisa Sakurai)

Table 4 Major infrastructure development

Item		Value	Remarks
Road	High standard arterial road	8,553 km	Length available as of end of fiscal 2003
	Urban expressway	674 km	
	National/prefectural road	182,420 km	Actual length as of April 1, 2002
	Municipal road	987,943 km	
Railroad		27,126 km	Length in passenger service as of January 2004
Waterworks (incl. simplified and exclusive waterworks)		96.7%	Diffusion rate as of end of fiscal 2001
Sewage system		65.2%	Diffusion rate as of end of fiscal 2003

(Sources: MLIT, MHLW, Japan Sewage Works Association)

2 For Improving Construction Information Services Using of Information Technology

2.1 Background and Objective of Foundation of JACIC

2.1.1 Background

Construction industry of Japan will bear construction investment of about 58.5 trillion yen (2002). It is a key industry, which has about 9.8% (2002) of the number of workers of all industries. In the construction industry, the latest information technology is taken in various fields, and there are various activities aiming the reform.

Table 5 Introduction rate of IT

	Constructors	Construction consultants
LAN	53%	79%
Intranet	50%	66%
e-Mail (Over 50% of the staff)	65%	70%
Web (Over 50% of the staff)	68%	53%
Security policy(Including a policy in progress)	20%	36%
CALS/EC	21%	31%
e-Bidding	54%	50%

(Researched by JACIC Oct.2003)

2.1.1 Objective

JACIC was founded on November 15, 1985, for the purpose of improving construction technology, streamlining construction projects and promoting safe and effective use of the land of the nation through research and permeation of construction information systems that contribute to smooth administration of construction projects as well as through provision of construction information, thereby bringing about advanced life of the people and revitalized economy.

2.2 Characteristics of Activities

Ever since its foundation, JACIC has developed various activities concerning computerization in the construction sector while cooperating with academic, business, and governmental circles and effectively introducing the latest information technology in order to accurately respond to the development of computerization, request of reform. The activities of JACIC are shown below.

(1) Improvement of construction management technology

(2) Collection, processing, storage and dissemination of the latest construction information

(3) Aid for research concerning construction information systems

(4) Promotion and permeation of computerization

2.3 Organization

JACIC conducts various activities with the organization as shown in Figure 1.

The numbers of supporting members, members of Electronic Bidding Core System Development Consortium, Construction Information Standardization Committee, etc. are as shown in Table 6.