BIM Adoption Status and buildingSMART Korea Activities

Asia Pacific Regional BIM Group Meeting

17th December 2019,
CIC BIM Space, Hong Kong

Inhan Kim
Professor, Kyung Hee University
Chief Vice-Chairman, buildingSMART Korea

http://buildingsmart.or.kr
Profile

Inhan Kim  Ph.D

Kyung Hee University
Professor, Department of Architecture

buildingSMART International
Member, Board of Director / Fellow

buildingSMART Korea
Founder, Chief Vice President

Society for Computational Design and Engineering
President (2020)

Korea Construction IT Convergence Institute
Chief Vice President

i3CDE
Congress Chair
buildingSMART Korea

- **History**:
  - Apr 16, 1996: IAI Korea (buildingSMART Korea) was established
  - Apr 25, 2008: Name is changed to buildingSMART Korea
  - Feb 20, 2009: Acquired establishment permission as a nonprofit corporation from Ministry of Land, Transport and Maritime Affairs

- **The purpose of establishment**:
  - Korea regional alliance of buildingSMART International
  - Review of open BIM regulations and reflect Korean existing construction model and process to open BIM
  - Role of representative organization in private industry to promote research on Building Information Modeling (BIM) and high-tech construction IT and its dissemination and application
  - Proliferation of Korean open BIM technology and infrastructure through practical use of BIM in construction industry and various policy proposal
  - Contribute to development and improvement of public welfare of international construction industry through participation of related international activities

- **Members status (Dec, 2016)**:
  - 205 companies, 20 associations, 23 universities
  - Total 5,441 (403 regular members & 196 associate members & 4,842 individual members)
## Members of bSK

### Member Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sponsor</td>
<td>1</td>
</tr>
<tr>
<td>Association / Society</td>
<td>13</td>
</tr>
<tr>
<td>Educational Institutions</td>
<td>23</td>
</tr>
<tr>
<td>Local Government</td>
<td>2</td>
</tr>
<tr>
<td>General Member</td>
<td>245</td>
</tr>
<tr>
<td>Regular Members</td>
<td>421</td>
</tr>
<tr>
<td>Associate Members</td>
<td>176</td>
</tr>
<tr>
<td>Individual Members</td>
<td>5,286</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5,903</td>
</tr>
</tbody>
</table>

(As of Nov 2019)
Major Activities

1. BIM Technology Diffusion
   - Event
   - Education
   - Publication
   - Acceptance of Opinions

2. International Activities
   - Member of International Organization
   - International Meeting
   - International Research Participation
   - Common Standard

3. National Policy Research
   - Ministry of Land, Infrastructure and Transport
   - Public Procurement Service
   - Advanced Architectural Administration System
   - Price of Services

4. Research and Development Consulting
   - National R&D
   - Private Consulting
   - Technical Realization
   - etc.
BIM Awards

BIM awards aim to encourage BIM adoption and proliferation by excavating organizations and personals contributing to BIM activation and then by awarding prizes. buildingSMART Korea holds BIM awards annually.

- **BIM AWARDS 2009**
  - BIM Vision Award, BIM Design Award, BIM Construction Award, Nov. 20, 2009

- **BIM AWARDS 2010**
  - BIM Vision Award, BIM Design Award, BIM Construction Award, BIM Green Award, Nov 22, 2010

- **BIM AWARDS 2011**
  - BIM Vision Award, BIM Design Award, BIM Construction Award, BIM Green Award, Nov 11, 2011

- **BIM AWARDS 2012**
  - BIM Vision Award, BIM Design Award, BIM Construction Award, BIM Green Award, Nov 05, 2012

- **BIM AWARDS 2013**
  - BIM Vision Award, BIM Design Award, BIM Construction Award, BIM Green Award, BIM Implementation Awards, Nov 04, 2013

- **BIM AWARDS 2014**
  - BIM Vision Award, BIM Design Award, BIM Construction Award, BIM Green Award, BIM Implementation Awards, BIM Engineering Award, BIM CM Award, BIM Research Award, BIM Education Award, BIM of Small-and Medium-Sized Award, BIM Innovations in Techniques Award, Nov 27, 2014

- **BIM AWARDS 2015**
  - BIM Vision Award, BIM Design Award, BIM Construction Award, BIM Green Award, BIM Implementation Awards, BIM Engineering Award, BIM CM Award, BIM Research Award, BIM Education Award, BIM of Small-and Medium-Sized Award, BIM Innovations in Techniques Award, Nov 26, 2015

- **BIM AWARDS 2016**
  - BIM Vision Award, BIM Design Award, BIM Construction Award, BIM Green Award, BIM Implementation Awards, BIM Engineering Award, BIM CM Award, BIM Research Award, BIM Education Award, BIM of Small-and Medium-Sized Award, BIM Innovations in Techniques Award, Sep 30, 2016
Domestic Activities

BIM Certification

- **BIM Technical Qualification Test**
  BIM Technical Qualification Test targets construction and design experts. It aims to implement BIM using a variety of software, with understanding of Open BIM. Recently, the training process contains the architectural design methodologies based on IPD (Integrated Project Delivery).

- **Technical Qualification**
  - BIM Modeler
  - BIM Technician
  - BIM Coordinator
  - BIM Manager

- **Test Schedule 2014**
  - BIM Technician – 6 times in a year
  - BIM Coordinator – 4 times in a year

- **Test Schedule 2015**
  - BIM Technician – 6 times in a year
  - BIM Coordinator – 4 times in a year
  - BIM Manager – 4 times in a year

- **Test Schedule 2016**
  - BIM Modeler – 3 times in a year
  - BIM Technician – 6 times in a year
  - BIM Coordinator – 4 times in a year

- **Test Subject & Selection Method**

<table>
<thead>
<tr>
<th>Written Test</th>
<th>Performance Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BIM Technician</strong></td>
<td>BIM Fundamentals</td>
</tr>
<tr>
<td>- BIM Series : Definition of BIM</td>
<td>Using BIM Tools User Interface</td>
</tr>
<tr>
<td>- Basic Revit Architecture 2013, SMC (Solibri Model Checker), Navisworks, Project Vasari, General Estimate</td>
<td>Starting a Project</td>
</tr>
<tr>
<td></td>
<td>Modeling a Project</td>
</tr>
<tr>
<td></td>
<td>Documenting a Project</td>
</tr>
<tr>
<td><strong>BIM Coordinator</strong></td>
<td>BIM Fundamentals</td>
</tr>
<tr>
<td>- BIM Series : BIM on Design, BIM on Engineering</td>
<td>BIM Technology</td>
</tr>
<tr>
<td>- Public Procurement Service BIM Guideline</td>
<td>BIM Design Process</td>
</tr>
<tr>
<td>- The Ministry of Transportation BIM Guide</td>
<td>Design Analysis</td>
</tr>
<tr>
<td></td>
<td>BIM Project Execution Plan</td>
</tr>
<tr>
<td><strong>BIM Manager</strong></td>
<td>Construction Planning and Coordination</td>
</tr>
<tr>
<td></td>
<td>BIM Deployment Plan</td>
</tr>
<tr>
<td></td>
<td>BIM Project Execution Plan</td>
</tr>
</tbody>
</table>
BIM Education

BIM professional training process targets construction and design experts. It aims to implement BIM using a variety of software, with understanding of Open BIM. Recently, the training process contains the architectural design methodologies based on IPD (Integrated Project Delivery).

BIM Technical Qualification Test  Special Education

- Qualification of Registration for Course
  - Certification Course in BIM Modeler
  - Certification Course in BIM Technician
  - Certification Course in BIM Coordinator
  - Certification Course in BIM Manager

Education Curriculum

<table>
<thead>
<tr>
<th>Curriculum</th>
<th>Subject</th>
<th>Hour</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIM Technician Course</td>
<td>Modeling</td>
<td>48H</td>
<td>BIM Introduction, Revit Basic Modeling, Revit 3D, NaviTouch BIM Browser</td>
</tr>
<tr>
<td></td>
<td>BIM Theory</td>
<td>2H</td>
<td>Introduction of BIM, Data exchange and IFC based on BIM</td>
</tr>
<tr>
<td></td>
<td>Basari</td>
<td>4H</td>
<td>Mass &amp; Environment Analysis Practice</td>
</tr>
<tr>
<td></td>
<td>SMC</td>
<td>10H</td>
<td>Definition and checking plan of BIM data quality, SMC basic Use</td>
</tr>
<tr>
<td></td>
<td>Midware System</td>
<td>8H</td>
<td>Supply and estimate based on 3D Modeling</td>
</tr>
<tr>
<td></td>
<td>Navisworks</td>
<td>8H</td>
<td>Concept of Navisworks, Visualization, Animation, Simulation and Evaluation</td>
</tr>
<tr>
<td>BIM Coordinator Course</td>
<td>Introduction</td>
<td>2H</td>
<td>BIM Introduction, Data exchange based on BIM, Practical use on design</td>
</tr>
<tr>
<td></td>
<td>Design</td>
<td>2H</td>
<td>Parametric design, Atypical design</td>
</tr>
<tr>
<td></td>
<td>BIM Practical Use</td>
<td>2H</td>
<td>BIM Practical use cases and prospect</td>
</tr>
<tr>
<td></td>
<td>BIM Theory</td>
<td>2H</td>
<td>BIM manager's conduction of business</td>
</tr>
<tr>
<td></td>
<td>Design Practice</td>
<td>16H</td>
<td>Spatial BIM, BIM Modeling, Modeling Assurance</td>
</tr>
<tr>
<td></td>
<td>Environment-Friendly Design</td>
<td>2H</td>
<td>BIM data Use, Analysis of energy</td>
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<tr>
<td></td>
<td>Environment-Friendly Practice</td>
<td>5H</td>
<td>BIM data Use, Analysis of energy</td>
</tr>
<tr>
<td></td>
<td>5D Supply &amp; Estimate</td>
<td>4H</td>
<td>Supply &amp; Estimate and Process Control based on BIM</td>
</tr>
<tr>
<td></td>
<td>4D Process Control</td>
<td>4H</td>
<td>Integrated BIM</td>
</tr>
<tr>
<td></td>
<td>BMG Review</td>
<td>1H</td>
<td>Review &amp; Discussion</td>
</tr>
<tr>
<td>BIM Manager Course</td>
<td>Manager Education</td>
<td>20H</td>
<td>Construction Planning and Coordination, BIM Deployment Plan, BIM Project Execution Plan</td>
</tr>
</tbody>
</table>

Domestic Activities

BIM Education
BIM Registration Service

BuildingSMART Korea has an online registration system that construction-related companies register their BIM applying projects and bSK verifies it. In addition, bSK compiles BIM applying projects, makes a database and offers it to anyone who is interested in.

Online Registration System has 7 input information fields:

- Company Information
- Registrant Information
- Master Project Information
- Performance Measurement Index
- Project Information
- Applied Software Information
- Upload Related Files

Cumulative Record 2009~2015

- Design company: 508
- Engineering company: 109
- CM company: 39
- IT&Software company: 283
- Total: 939
I. buildingSMART International
II. buildingSMART Korea
III. bSK MOU
IV. International Activities
V. Domestic Activities
VI. Publication
VII. Research
Publication History

【BIM Event & Publication】

1998 ~ 2020

- 2008
  - 2008
  - 2009
  - 2010
  - 2011
  - 2012
  - 2013
  - 2014
  - 2015
  - 2016
  - 2017
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  - 2019
  - 2020

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- 2019
- 2020
The BIM Journal

“The BIM” is issued twice a year.

- **Purpose**: promotion of spreading BIM, advanced IT research and best practices in the AEC/FM industry
- **Publisher**: buildingSMART Korea
- **Distribution**: governmental agencies, public organizations, private companies, universities
- **Effect**: contribution to BIM adoption and proliferation
- **Published 11 editions through Jul 2008 ~ May 2015**
  - Vol.1 - “New Paradigm of construction”
  - Vol.2 - “Global Trend BIM Activities in Korea and Other Countries”
  - Vol.3 - “How to Enhance the BIM Quality”
  - Vol.4 - “The Future of BIM Where are we and where are heading for?”
  - Vol.5 - “The Choice of Smart Clients, BIM”
  - Vol.6 - “Lessons from some years of BIM in construction in Korea”
  - Vol.7 - “Gradual diffusion of BIM requirements”
  - Vol.8 - “From small BIM to open BIM”
  - Vol.9 - “Diving deeper into the BIM Practice”
  - Vol.10 - “Expanding the boundaries of BIM”
  - Vol.11 - “Widening the BIM Spectrum by Benchmarking Global Best Practices”
  - Vol.12 - “See, Enjoy, and Share”
  - Vol.13 - “Restart”
  - Vol.14 - “BIM Awards 2015”
  - Vol.15 - “Transformation Our Construction Industry through Innovation and Collaboration”
  - Vol.16 - “The BIM 2016”
I. buildingSMART International

II. buildingSMART Korea

III. bSK MOU

IV. International Activities

V. Domestic Activities

VI. Publication

VII. Research
National BIM R&D Project
### Major Research Project on OpenBIM:

Establishment of Open BIM based Building Design Environment for Improving Design Productivity, KAIA under MOLIT

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Funding Institution</strong></td>
<td><strong>Funding Institution</strong></td>
</tr>
<tr>
<td>MOLIT (Ministry of Land, Infrastructure and Transport in Korea)</td>
<td></td>
</tr>
<tr>
<td><strong>Leading Research Organizations</strong></td>
<td><strong>Leading Research Organizations</strong></td>
</tr>
<tr>
<td>01 buildingSMART Korea</td>
<td>01 buildingSMART Korea</td>
</tr>
<tr>
<td>02 Kyung Hee University</td>
<td>02 Kyung Hee University</td>
</tr>
<tr>
<td>03 Hangil IT Co., Ltd</td>
<td>03 KICT (Korea Institute of Civil and Building Technology)</td>
</tr>
<tr>
<td>With 21 collaborative research organizations</td>
<td>With 30 collaborative research organizations</td>
</tr>
<tr>
<td><strong>Project Period</strong></td>
<td><strong>Project Period</strong></td>
</tr>
<tr>
<td>2013. 11. 13 – 2016. 11. 12 (3 years)</td>
<td>2017. 3. 29 – 2022. 12. 31 (5 years)</td>
</tr>
<tr>
<td><strong>Consist of Three Sub-Projects</strong></td>
<td><strong>Consist of Three Sub-Projects</strong></td>
</tr>
<tr>
<td>01 Open BIM based Building Design Standard and IT-Infrastructure</td>
<td>01 Development of OpenBIM Platform for IT Integrated Architectural Design and Application Technology</td>
</tr>
<tr>
<td>02 Open BIM based Technological Environment For Building Design Quality Enhancement</td>
<td>02 Development of OpenBIM based Architectural Design Code Checking and Evaluation Technology</td>
</tr>
<tr>
<td>03 BIM-based Cloud Computing Services and Systems Development</td>
<td>03 Development of OpenBIM based Existing Building Facility Management Core Technology</td>
</tr>
<tr>
<td><strong>Funding Amount (only Direct Government Funding)</strong></td>
<td><strong>Funding Amount (only Direct Government Funding)</strong></td>
</tr>
<tr>
<td>Approx. KRW 10,800m (USD 9.7m)</td>
<td>Approx. KRW 14,200m (USD 12.7m)</td>
</tr>
</tbody>
</table>
BIM: Building Information Modeling

Part 1: BIM Modeling
- Libraries-Technical Contents
  - Architecture
  - Structure
  - MEP
  - Library
  - Material
  - Details

Part 2: Construction
- 3D Printer
- Robot
- Driverless Car

Part 3: Facility Management
- Sensor
- Automatic BEMS

Analysis + Permission
- Collaboration
- Energy
- Quality
- Code

IT Convergence
- AR
- IPS
- Laser Scan
- Mobile DRON

Image Source: Google Search, Autodesk
Part 1  OpenBIM Platform for IT Integrated Architectural Design and Application Technology

1-1  BIM Standard Information Framework
- Process
- Structure
- MEP
- Guides
- Classification
- Information Spec.
- BIM General
- BIM Management
- SW and Contents
- OpenBIM Standard
- BIM Element
- Facility Management

1-2  Expansion of Libraries and Technical Contents

1-3  Construction Industry BIM Contents Repository

1-4  Design Efficiency Innovation Technology based on OpenBIM Platform

1-5  Efficiency Innovation Technology for CD Drawings
### 1-1 Expansion of BIM Information Standard for IT Integrated Design

#### 1. BIM General
- 11. Terms
- 12. Interpretation for Terms
- 13. Abbreviations
- 14. Uses of BIM
- 15. BIM Information Level
- 16. Maturity Model

#### 2. Process
- 21-1. Design Unit Tasks
- 21-2. Design Process
- 22. BIM Uses Scenarios

#### 3. Guides
- 32. Guide for Modeling
- 33. Guide for 2D Drawings
- 34. Guide for Documents
- 35. BIM Execution Plan

#### 4. BIM Element
- 41. BIM Object
- 42. BIM Properties
- 43. Dictionary for Properties

#### 5. Information Spec.
- 51. Project Information
- 52. Electronic Catalogue
- 53. Analysis Input Data
- 54. Analysis Output Data
- 55. Detail Classification
- 56. Space Design Contents
- 57. WBS-CBS Connection Standard
- 58. LCC Standard

#### 6. Classification
- 61. Facilities by Form
- 62. Spaces by Function
- 63. Elements
- 64-1. Work Results
- 65-1. Materials
- 65-2. Equipments
- 65-3. Resources
- 66. Properties
- 69-1. Phase
- 69-2. Disciplines
- 69-3. Roles
- 69-4. Information

#### 7. OpenBIM Standard
- 71. IDM
- 72. MVD
- 73. IFC
- 74. IFD
- 74-1 bSDD
- 75. IFG
- 76. COBie
- 79. Others

#### 8. SW and Contents
- 81. Functional Spec for Software
- 82. BIM Contents Guides
- 83-1. BIM Curriculum
- 83-2. BIM Education Materials

#### 9. BIM Management
- 91. BIM Management Process
- 95. BIM ROI
- 96. BIM Return of Investment and Fees
- 99. Indicators

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**9 Categories, 56 Modules (+α)**

**Supplementation** 36  **Addition** 4 (+α)  **Reference** 16

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**Refer to KCCS**
**Update Research Result of Stage1**
**Development of Management Technology**
**Adoption of International Standard**
**Update Research Result of Stage1**
**Update Research Result of Stage1**
**Update Research Result of Stage1**
**Update Research Result of Stage1**

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**Building SMART International home of OpenBIM Korea**
1-2 Expansion of Architectural Libraries and Technical Contents

Library Development Expansion

- Stage 1: 3,257
- Stage 2: 8,000

Technical Contents Development Expansion

- Stage 1:
  - Details: 423
  - Cost Information: 755
  - Material Information: 2,855
- Stage 2:
  - Details: 600
  - Cost Information: 1,200
  - Material Information: 15,000

Decision Making Support Contents

Prototype based on Space Classification
- Space Program
- Finish Material
- Room Data Sheet

Construction Industry BIM Contents Repository

- Designer
- Builder
- Engineer
- Contractor
- SW Vendor
- Contents Vendor
- Public
- National
- Material Company
- Design Office A
- Design Office B
- Construction Office A

OpenBIM Platform (Libraries-Technical Contents Service Platform)
1-4 Design Efficiency Innovation Technology based on OpenBIM Platform

- Decision Making Tech.-Finishing
- Decision Making Tech.-Element
- Decision Making Tech.-Design Requirement
- Decision Making Tech.-Space Planning

Object Segmentation of Design Model
- Partially Automaton of CD Level Model base on Specific Rule

BIM-Design Table Connection Technology
BIM-Specification Connection Technology
- Tables, Specifications and so on

Step-by-Step Efficiency Innovation Technology
- Construction Cost Review Technology
- Rough Estimation
- Detail Estimation

Decision Making Tech.-Space Planning

Construction FM BIL50 /60

DD BIL30

CD BIL40

SD BIL20

PD BIL10
Policies in Korea
The 4th Industrial Revolution Strategy

- **The 4th industrial revolution Concept and scope**
  - **Micro Range**: Smart factory based on IoT, AI, sensors, etc. (Germany Industrie 4.0)
  - **Mid Range**: Manufacturing Revolution to improve Productivity (OECD)
  - **Macro Range**: Industrial revolution based on the convergence of physics technology, digital technology and biological technology (WEF, Klaus Schwab)

- **the 4th Industrial Revolution Characteristics and Implications**
  - **[Technology Change]**
    - Wearable Device
    - Virtual Reality
    - 3D Printing
    - Connected Home
    - Automotive Vehicles
    - Connected Home
    - Blockchain
    - Smart Factory
    - Smart City
    - 5G
    - AI
    - Big Data
    - Cloud

  - **[Social and Economic Change]**
    - Industry
      - Platform economy, Rise of knowledge industry, Integration of existing industry and technology
    - Labor
      - Restructuring the workforce, Increasing new jobs
    - Life
      - Hyper-connected based customized service, Improve safety and convenience
      - Increasing the importance of personal information, Income Polarization Problem

- **Vision**
  - Innovate for people to experience transportation service by the 4th Industrial Revolution

- **Goal**
  - Innovate public service and business competition and Improve the quality of life
  - Create the right conditions and respond to the 4th Industrial Revolution in the Transportation Industry

- **Key Tasks**
  1. **Smart Nation**
     - ① Build Total Test-Bed for the New business
     - ② Smart City and Smart spatial planning
     - ③ Enhance spatial information and provide convergence service
  2. **Transportation Industry Biz**
     - ① Innovate AI and Big data based transportation service
     - ② Foster autonomous vehicles, drones, logistics service
     - ③ Increase efficiency of Road, Rail and Air service
  3. **Public Infrastructure, Safety, Efficiency**
     - ① Enhance safety and efficiency throughout the construction cycle
     - ② IoT-based proactive SOC maintenance
     - ③ Smart water resource utilization and safe management
  4. **Foundation of Innovation**
     - ① Expand Research Project investment and improve management system
     - ② Open to public of Traffic public data and Support utilization
     - ③ Innovate Regulatory and Human resource Training

Adapted by Italab (Sejin Lee, Kyung-Eun Hwang)
The 4th Industrial Revolution Strategy: Smart Nation

**Goal**
Create a new industrial and new service platform through hyper-connected society

- **Build Total Test-Bed Business**
  - Build Smart city having living lab, where technology development and actual living work simultaneously to commercialize new technologies

- **Smart City and Living Space**
  - Propose the Smart Residential model
  - Improve Building Performance by incorporating the Intelligent building Management
    - Use of BEMS* to improve energy efficiency throughout the life cycle of the building
    - Full-scale utilization of BIM technology that can collect, manage and utilize all building-related information on a BIM(3D) basis
      - Establish the integrated service system (SEUMTER** platform) that provides building life information to users respectively
  - Build a smart city where people can experience and create new businesses

- **Enhance Spatial information and provide convergence service**
  - Collect the customized and precise spatial data, and enhance data set
  - Create a foundation to provide convergence services using spatial data

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* Building Energy Management System: System that helps to save energy by improving building operation and energy efficiency using ICT technology
** SEUMTER: e-permission System of Korea

* Adapted by Italab (Sejin Lee, Kyung-Eun Hwang)
Strategy 02. Create new value through technology convergence

Realization of construction intelligence by convergence technology

The strategic goal of “Intelligent Construction Production System”, which innovates construction processes such as design, management, construction, and maintenance by convergence of artificial intelligence and robots.

- Develop the “AI-based design and management”, a convergence engineering technology such as artificial intelligence, and “Construction automation” with 3D printer and robot.

Technology Strategy Tree

<table>
<thead>
<tr>
<th>Technology Components</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>BIM based intelligent design</td>
</tr>
<tr>
<td>Engineering</td>
<td>Construction process integrated management platform</td>
</tr>
<tr>
<td>Material</td>
<td>3D printing architecture / construction system</td>
</tr>
<tr>
<td>Construction</td>
<td>Autonomous Construction Equipment and Robot</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Facility unattended diagnostic system</td>
</tr>
</tbody>
</table>

Intelligent Construction Production System

- AI-based Design Management
- Construction Automation

- Development of a new Design & Engineering model for the convergence of 4th Industry Revolution technologies such as AI in order to secure competitiveness in Design & Engineering, Korea’s weakness

- Design & Engineering
  - Innovate your design review and verification process with VR, AR, and BIM technology that can be transformed into content
  - Design based on BIM design construction technology to reduce costs and time by digitalizing the entire construction process, digitalizing the production of architectural models and products
  - Designing in consideration of various building conditions based on artificial intelligence, Design automation by developing verification technology

- Construction Automation
  - Database various unstructured data from the construction process
  - Build an engineering-focused platform in terms of cost, process and quality control etc.

- Construction
  - Develop new materials and devices such as 3D printing composite materials and construction robots to improve construction efficiency
  - Develop Maintenance Automation Technology

- Increase safety and efficiency by On-site customized autonomous measurement, management system, automatic drive construction equipment, robot, BIM-based construction, development of verification and evaluation technology

  - Development of risk detection technology for workers and structures in advance based on multiple sensors
  - Development of construction equipment and robot control technology that autonomously perform road excavation, building demolition, etc. in hazardous areas

  - Automatic Excavating Equipment, Unmanned Crane, Direct Slip Form, etc.
  - Advancing existing construction equipment and developing a construction equipment management system

Courtesy of KIRA and Italab, KHU (Sejin Lee, Kyung-Eun Hwang)
The 6th Construction Technology Promotion Basic Plan: Smart Construction 2025

**Vision**
- “Smart Construction 2025”
  - Development of construction automation technology applying BIM and AI by 2025

**Goal**
- Construction labor productivity by +40%, Death rate by -30%, Construction engineering hour rates by -20%
  * Hourly Productivity (Korea Productivity Center): (’15) 13.6$ → (’20) 19$
  ** Construction Industry Deaths (Safety & Health Agency): (’16) 554 → (’21) 388
  *** Annual working hours(Eng. Labor): 2,560 H → (’21) 2,100 H
- Expand overseas orders for Construction Eng. By +100%
  * Statistics on overseas orders(Foreign Contractors Association): (’16) 1.7 billion $ → (’22) 3.4 billion $

**Key Strategy**

**Strategy I**
- Development of technology in response to the 4th industrial revolution, and enhance new business

<table>
<thead>
<tr>
<th>Field</th>
<th>Key Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology development</td>
<td>① Productivity Enhancement through Smart Construction Technology&lt;br&gt; ② Development of construction technology for overseas demand</td>
</tr>
<tr>
<td>Fostering high value-added industries</td>
<td>③ Interdisciplinary, Strengthen competitiveness through compound&lt;br&gt; ④ Foster new business through construction Big Data distribution</td>
</tr>
<tr>
<td>Strengthen construction safety</td>
<td>⑤ Construction safety · Environment management</td>
</tr>
</tbody>
</table>

**Strategy II**
- Improve the policy to strengthen global market competitiveness

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Industrial Reorganization·Promotion</td>
<td>① Strengthen Eng. capacity and support overseas expansion&lt;br&gt; ② Make a policy that meets international standards</td>
</tr>
<tr>
<td>Construction Manpower·Education</td>
<td>③ Establish a career management system that meets global standards&lt;br&gt; ④ Fostering technical manpower having global competitiveness</td>
</tr>
<tr>
<td>Standard·Policy</td>
<td>⑤ Technology-driven ordering and enhancing deliberation</td>
</tr>
</tbody>
</table>

**Smart Construction Automation**
- Virtual construction, Member modular manufacture, Robot assembly
- Construction automation technology using BIM and AI to be developed until 2025

**Key Task**

- Development of smart construction technology in response to the fourth industrial revolution
- Strengthening International Competitiveness in Construction Engineering
- Reinforcement of maintenance and construction safety

*Courtesy of KIRA and Italab, KHU (Sejin Lee, Kyung-Eun Hwang)*
Architectural Administrative Service Innovation Plan

- **Regulation Innovation**
  - Permit Review
    - Building Permit department
    - 30 days
  - Deliberation
    - Design
    - 44 days
  - Building Certification
    - Green Building, Intelligent Building, Energy Efficiency Rating, Zero Energy
    - 4 certifications

- **Information Innovation**
  - Fields
    - BIM, AI
      - Review the suitability of the design using artificial intelligence technology
      - [Improve architectural design efficiency]
      - [Reduce design time by 30%]
      - [Reduce design error by 90%]
    - IoT
      - Safety management in construction sites in real-time by sensors
      - [Improve resource quality management efficiency]
      - [Reduce production time by 20%]
      - [Achieve quality certification reliability by 99%]
    - Robot Assistance
      - Improve production efficiency, overcome worker's body limits, minimize risk work
      - [Improve construction efficiency]
      - [Reduce management time by 50%]
      - [Reduce construction time by 20%]
    - Drone
      - Remotely inspect safety using drones based on VR / AR
      - [Improve performance management efficiency]
      - [50% reduction in inspection and diagnosis time]
      - [30% expansion in related markets]

- **Job Innovation**
  - Opening to architectural drawing information
  - Support for young Start-ups in architectural field
  - Support for youth recruitment and field training in the architectural field
  - Lower entry barriers to architectural design to nurture young architects

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Application for Permission

Permit Review
- Building Permit department
- (Review of local building center)
- Within 7 days of the center confirmation (except for the review period)

Building Certification
- Smart Building Certification
- 1 certification (Unification)

Architectural Administrative Service Innovation Plan

- Regulation Innovation
- Information Innovation
- Job Innovation

Fields
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<th>Goal</th>
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<td>Review the suitability of the design using artificial intelligence technology</td>
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Application for Permission

Permit Review
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Building Certification
- Smart Building Certification
- 1 certification (Unification)

Architectural selection on AR screen
Selection of Building Needs
Provide construction site information

Courtesy of KIRA and Italab, KHU (Sejin Lee, Kyung-Eun Hwang)
AI Technology Application Status by Industry

**Future AI demand trajectory**
Average estimated % change in AI spending, next 3 years, weighted by firm size

% of firms adopting one or more AI technology at scale or in a core part of their business, weighted by firm size

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1 Based on the midpoint of the range selected by the survey respondent.
2 Results are weighted by firm size. See Appendix for an explanation of the weighting methodology.


McKinsey & Company
Research Projects Overview in Korea

**BIM Research Project**
Development of openBIM-based Architectural Design Support Automation and Facility Management Technology

**AI Research Project**
Development of AI-based Core Technologies for Architectural Automation and Establishment of a Design Knowledge Platform

**OSC Research Project**
Development of Innovation Technology for Apartment House Production System based on Off-Site Construction
Development of openBIM based Architectural Design Support Automation and Facility Management Technology
Development of AI-based Core Technologies for Architectural Automation and Establishment of a Design Knowledge Platform

Vision and Goal

- Vision
  - Architectural design ecosystem innovation through artificial intelligence based design knowledge platform

Final research goals

- 45% automation implementation of architectural design decisions
- Intelligence based on design characteristics development of architectural process
- High-value TOP 5 architectural design power

Research strategy

- Detailed task composition
  - Creative Design
    - To strengthen design capabilities artificial intelligence based design development alternative technology (Planning - Plan)
  - Efficient Design
    - Improve design productivity Automation of design for technology development (Implementation - Detailed)
  - High value added design
    - Improvement of intelligent design quality technology development (Design - Construction - Operation)

- Representative Core Technology Elements By Specific Tasks
  - Intelligent human object initial application technology
  - Spatial model centering design technology
  - Form functional design alternatives automatic generation technology
  - Design knowledge learning server construction and utilization technology
  - Optimization of architectural / structural design
  - Detail design / MEP automation
  - Intelligent information management solution
  - Parametric / artificial Intelligence based virtual construction solution

- Benefit
  - Creating high quality jobs
  - Architecture design automation localization of source technology
  - To the world design Market expansion

- Sustainable design
  - 4th industry-oriented architecture design services for innovation development of technology diffusion model
  - Architectural design artificial intelligence Service platform
  - Future architectural design consulting model
  - Design automation information standard framework
Development of Innovation Technology for Apartment House Production System Based on Off-Site Construction

**Vision**
Improving Housing Welfare and Competitiveness of the Construction Industry through the Innovation of the Production System of Apartment Houses

**Goal**
Development of Innovation Technology for Apartment House Production System Based on Off-Site Construction

**Action**
- Analysis of Trends in Market and Technology Policies
- Deriving Key Technology Challenges through Demand Survey and Priority Analysis
- Preparation of a Roadmap for the Development of Policy / Technical / Practical Technologies
- Detailed Planning and Practicalization Plan for Practical Use of Technology and Preparation of RFP for Research Ordering

**Target**
- **Apartment House**
  - Apartment House according to the Enforcement Decree of the Building Act [Appendix 1]
- **Off-Site Construction**
  - Planning, Production, Transportation in the Factory and Site Installation / Constriction Method
- **Production System**
  - The entry, exit, scope of work and the combination of production entities throughout the entire construction production process

**Content**
- OSC-based architectural production system related technology, market, policy, industry trend / environment analysis
- OSC-based futuristic apartment house prototype development
- Selected as core element technology of OSC based apartment house production system
- Establishment of research and development direction for OSC-based apartment housing production system establishment project and suggest specific implementation strategy
- Suggests improvement of laws and systems for OSC-based apartment housing production system project