# 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**

buildingSMART International home of openBIM KOREA

# 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(bSK)

- **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

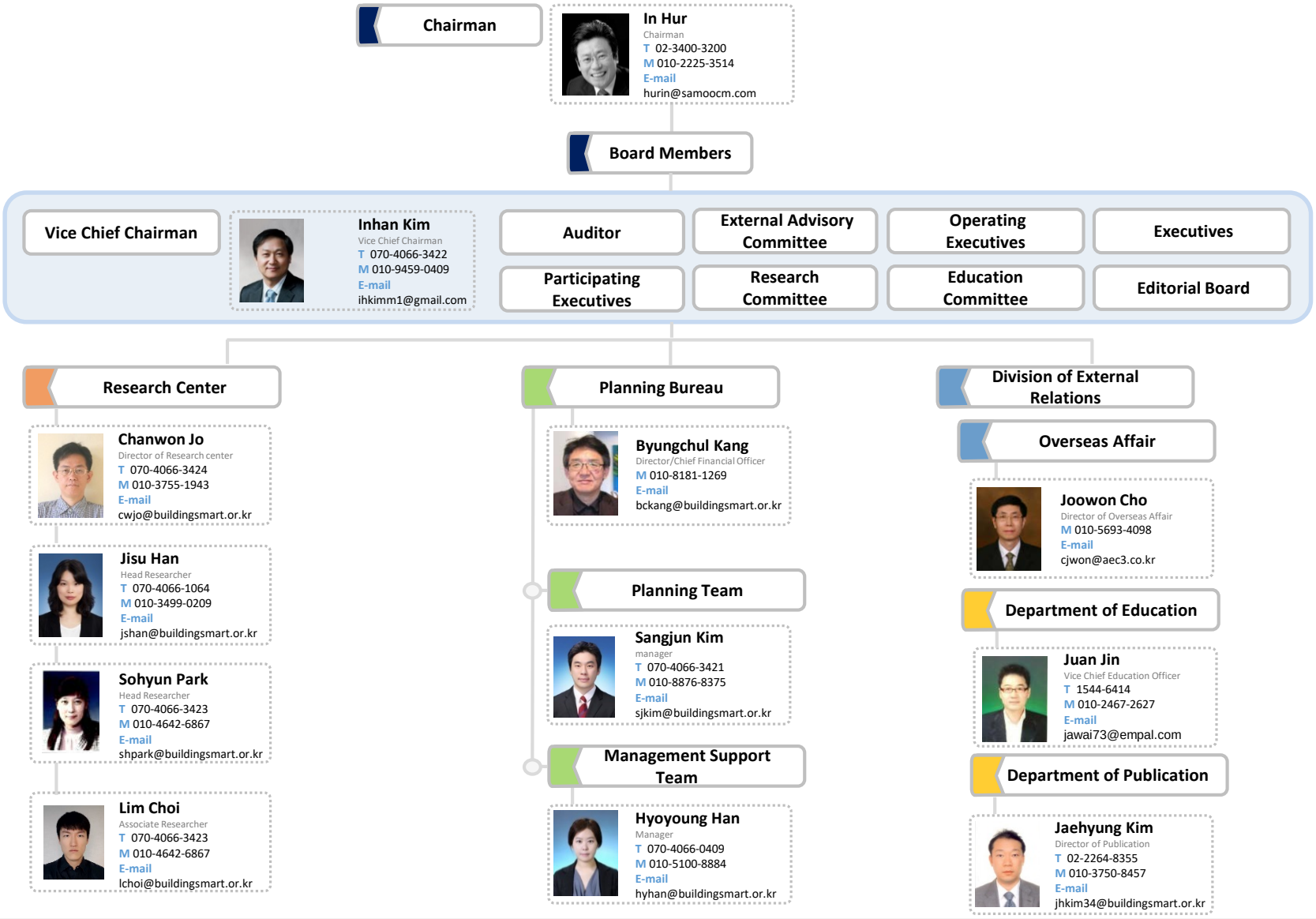
- **Members status (Dec, 2016) :**

  205 companies, 20 associations, 23 universities
  Total 5,441 ( 403 regular members & 196 associate members & 4,842 individual members)

## Member Status

| | |
|---|---|
| Sponsor | 1 |
| Association / Society | 13 |
| Educational Institutions | 23 |
| Local Government | 2 |
| General Member | 245 |
| Regular Members | 421 |
| Associate Members | 176 |
| Individual Members | 5,286 |
| Total | 5,903 |

(As of Nov 2019)


Chairman
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## 1 BIM Technology Diffusion

Event

Education

Publication

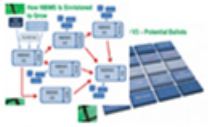
Acceptance of Opinions

## 2 International Activities

Member of International Organization

International Meeting


International Research Participation



Common Standard

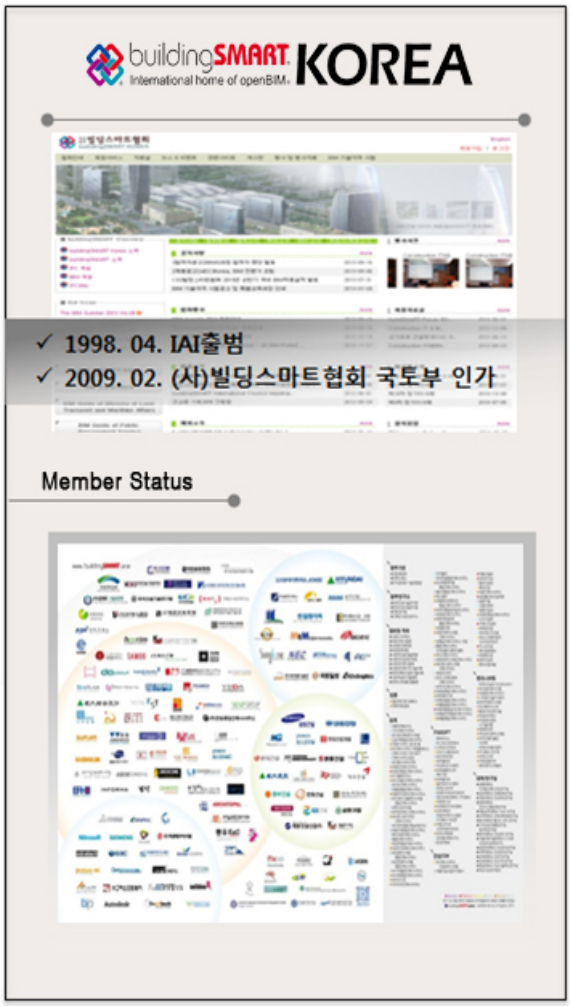
## 3 National Policy Research

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 Consiting

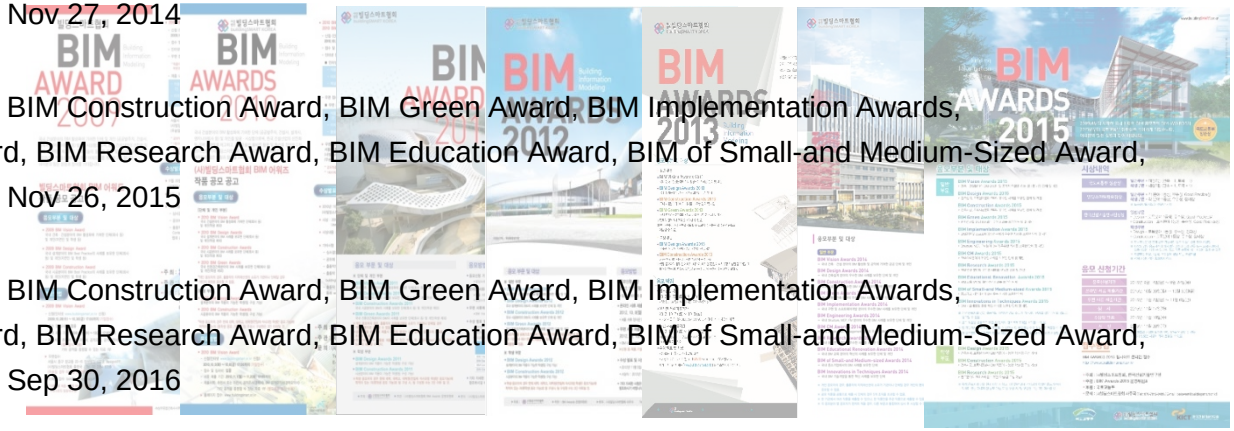
Technical Realization

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



## ➢ 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

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

## ➢ BIM Education

BIM professional traning process targets construction and design experts. It aims to implement BIM using a variety of software, with understanding of Open BIM. Recently, the traning 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

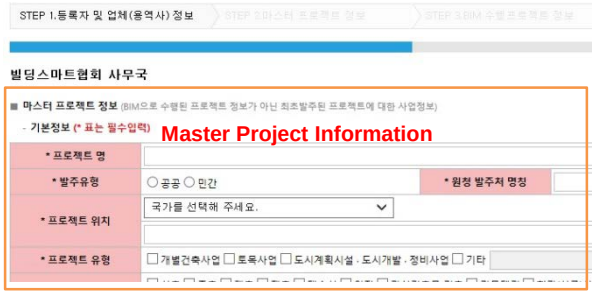
| Curriculum | Subject | Hour | Contents |
|---|---|---|---|
| BIM Technician Course 80 Hours | Modeling | 48H | BIM Introduction, Revit Basic Modeling, Revit 3D, NaviTouch BIM Browser |
| | BIM Theory | 2H | Introduction of BIM, Data exchange and IFC based on BIM |
| | Basari | 4H | Mass & Environment Analysis Practice |
| | SMC | 10H | Definition and checking plan of BIM data quality, SMC basic Use |
| | Midware System | 8H | Supply and estimate based on 3D Modeling |
| | Navisworks | 8H | Concept of Navisworks, Visualization, Animation, Simulation and Evaluation |
| BIM Coordinator Course 40 Hours | Introduction | 2H | BIM Introduction, Data exchange based on BIM, Practical use on design |
| | Design | 2H | Parametric design, Atypical design |
| | BIM Practical Use | 2H | BIM Practical use cases and prospect |
| | BIM Theory | 2H | BIM manager's conduction of business |
| | Design Practice | 16H | Spatial BIM, BIM Modeling, Modeling Assurance |
| | Environment-Friendly Design | 2H | BIM data Use, Analysis of energy |
| | Environment-Friendly Practice | 5H | BIM data Use, Analysis of energy |
| | 5D Supply & Estimate | 4H | Supply & Estimate and Process Control based on BIM |
| | 4D Process Control | 4H | Integrated BIM |
| | BMG Review | 1H | Review & Discussion |
| BIM Manager Course | Manager Education | 20H | Construction Planning and Coordination, BIM Deployment Plan, BIM Project Execution Plan |

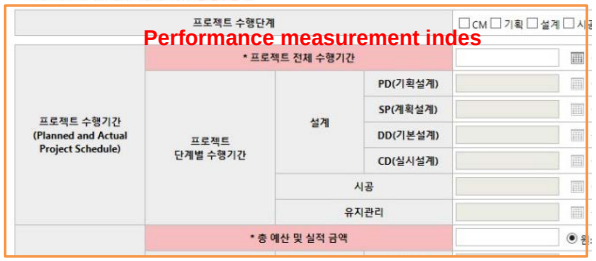
## ➢ BIM Registration Service

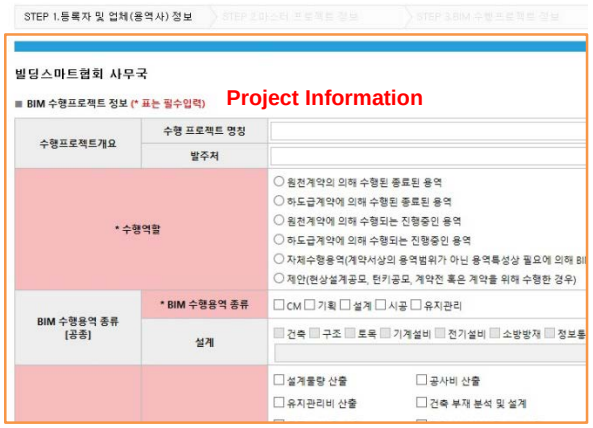
buildingSMART Korea has an online registration system that construction-related companies register their BIM applying projects and bSK verifies it. In addition, bSK compiles BIM applying projects, make a database and offer it to anyone who is interested in.

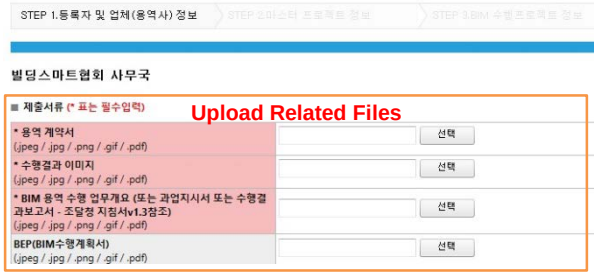
Online Registration System has 7 input information fields

- 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** |

# Contents

## ➢ BIM Event & Publication

## ➢ 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"

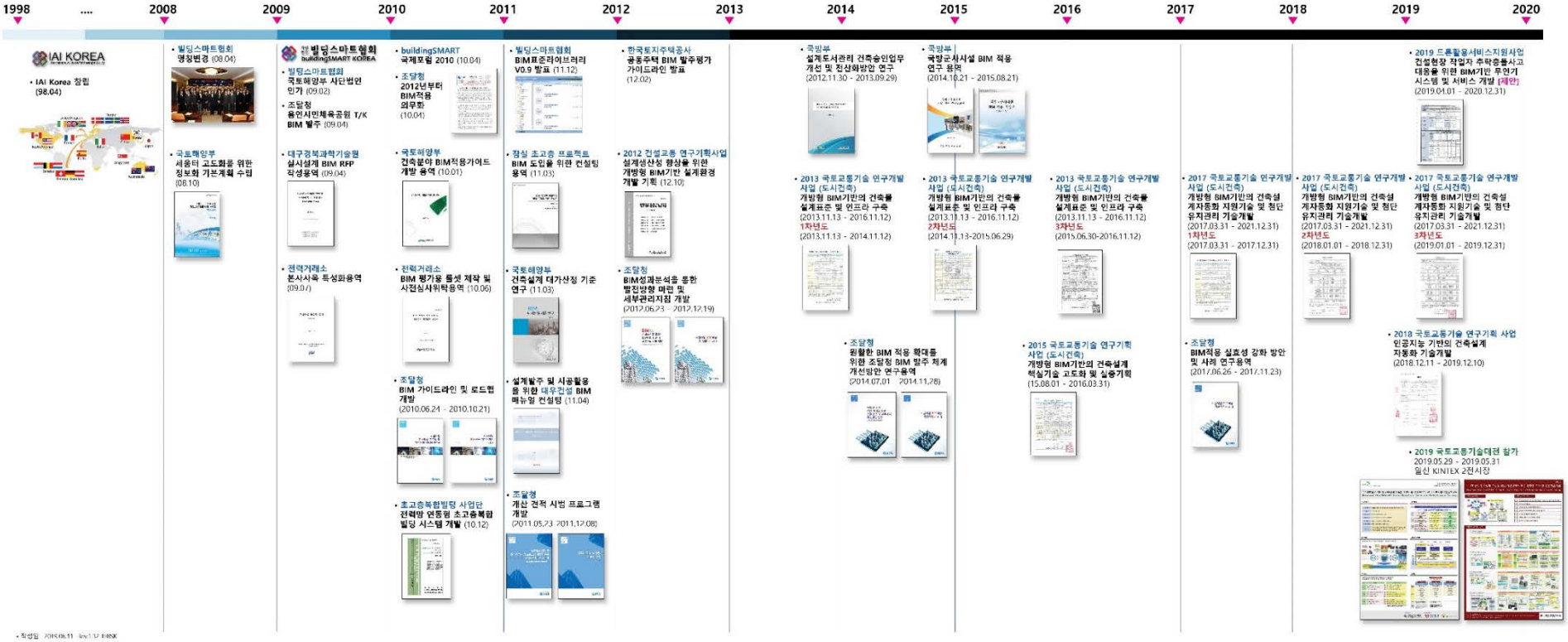
Vol 13 - "Restart"

Vol 14 - "BIM Awards 2015"

Vol 15 - "Transformation Our Construction Industry through Innovation and Collaboration"

Vol 16 - "The BIM 2016"

# Contents


1998
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IAI KOREA
• IAI Korea 창립 (98.04)
• 빌딩스마트협회 명칭변경 (08.04)
• 국토해양부 세움터 고도화를 위한 정보화 기본계획 수립 (08.10)
• 빌딩스마트협회 buildingSMART KOREA
• 빌딩스마트협회 국토해양부 사단법인 인가 (09.02)
• 조달청 용인시민체육공원 T/K BIM 발주 (09.04)
• 대구경북과학기술원 실시설계 BIM RFP 작성용역 (09.04)
• 전력거래소 본사사옥 특성화용역 (09.0/)
• buildingSMART 국제포럼 2010 (10.04)
• 조달청 2012년부터 BIM적용 의무화 (10.04)
• 국토해양부 건축분야 BIM적용가이드 개발 용역 (10.01)
• 전력거래소 BIM 평가용 툴셋 제작 및 사전심사위탁용역 (10.06)
• 조달청 BIM 가이드라인 및 로드맵 개발 (2010.06.24 - 2010.10.21)
• 초고층복합빌딩 사업단 전력망 연동형 초고층복합 빌딩 시스템 개발 (10.12)
• 빌딩스마트협회 BIM표준라이브러리 V0.9 발표 (11.12)
• 잠실 초고층 프로젝트 BIM 도입을 위한 컨설팅 용역 (11.03)
• 국토해양부 건축설계 대가산정 기준 연구 (11.03)
• 설계발주 및 시공활용을 위한 대우건설 BIM 메뉴얼 컨설팅 (11.04)
• 조달청 계산 견적 시범 프로그램 개발 (2011.05.23 - 2011.12.08)
• 한국토지주택공사 공동주택 BIM 발주평가 가이드라인 발표 (12.02)
• 2012 건설교통 연구기획사업 설계생산성 향상을 위한 개방형 BIM기반 설계환경 개발 기획 (12.10)
• 조달청 BIM성과분석을 통한 발전방향 마련 및 세부관리지침 개발 (2012.06.23 - 2012.12.19)
• 국방부 설계도서관리 건축승인업무 개선 및 전산화방안 연구 (2012.11.30 - 2013.09.29)
• 2013 국토교통기술 연구개발사업 (도시건축) 개방형 BIM기반의 건축물 설계표준 및 인프라 구축 (2013.11.13 - 2016.11.12) 1차년도 (2013.11.13 - 2014.11.12)
• 조달청 원활한 BIM 적용 확대를 위한 조달청 BIM 발주 체계 개선방안 연구용역 (2014.07.01 - 2014.11.28)
• 국방부 국방군사시설 BIM 적용 연구 용역 (2014.10.21 - 2015.08.21)
• 2013 국토교통기술 연구개발사업 (도시건축) 개방형 BIM기반의 건축물 설계표준 및 인프라 구축 (2013.11.13 - 2016.11.12) 2차년도 (2014.11.13-2015.06.29)
• 2015 국토교통기술 연구기획사업 (도시건축) 개방형 BIM기반의 건축설계 핵심기술 고도화 및 실증기획 (15.08.01 - 2016.03.31)
• 2013 국토교통기술 연구개발사업 (도시건축) 개방형 BIM기반의 건축물 설계표준 및 인프라 구축 (2013.11.13 - 2016.11.12) 3차년도 (2015.06.30-2016.11.12)
• 2017 국토교통기술 연구개발사업 (도시건축) 개방형 BIM기반의 건축설계자동화 지원기술 및 첨단 유지관리 기술개발 (2017.03.31 - 2021.12.31) 1차년도 (2017.03.31 - 2017.12.31)
• 조달청 BIM적용 실효성 강화 방안 및 사례 연구용역 (2017.06.26 - 2017.11.23)
• 2017 국토교통기술 연구개발사업 (도시건축) 개방형 BIM기반의 건축설계자동화 지원기술 및 첨단 유지관리 기술개발 (2017.03.31 - 2021.12.31) 2차년도 (2018.01.01 - 2018.12.31)
• 2017 국토교통기술 연구개발사업 (도시건축) 개방형 BIM기반의 건축설계자동화 지원기술 및 첨단 유지관리 기술개발 (2017.03.31 - 2021.12.31) 3차년도 (2019.01.01 - 2019.12.31)
• 2018 국토교통기술 연구기획 사업 인공지능 기반의 건축설계 자동화 기술개발 (2018.12.11 - 2019.12.10)
• 2019 드론활용서비스지원사업 건설현장 작업자 추락충돌사고 대응을 위한 BIM기반 무인기 시스템 및 서비스 개발 [제안] (2019.04.01 - 2020.12.31)
• 2019 국토교통기술대전 참가 2019.05.29 - 2019.05.31 일산 KINTEX 2전시장

# 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**



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

# BIM : Building Information Modeling



## Analysis + Permission

Part 2

Collaboration | Energy | Quality | Code ...

## Construction

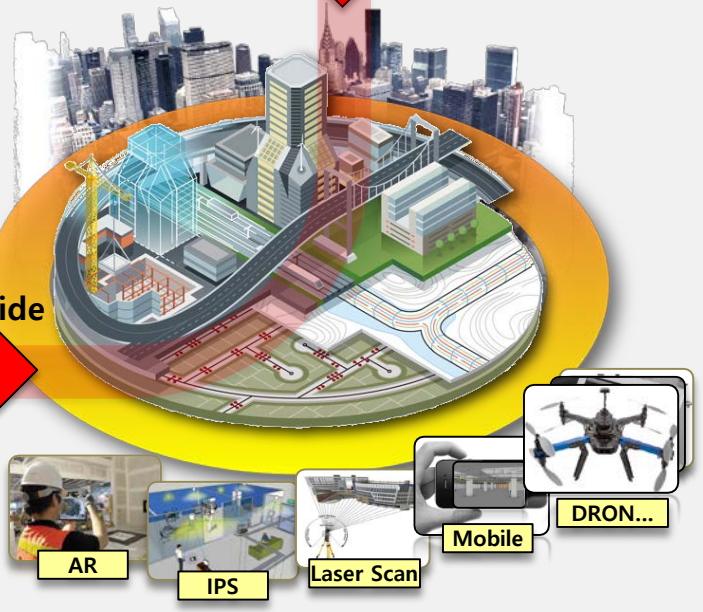
3D Printer | Robot | Driverless Car

## Facility Management

Part 3

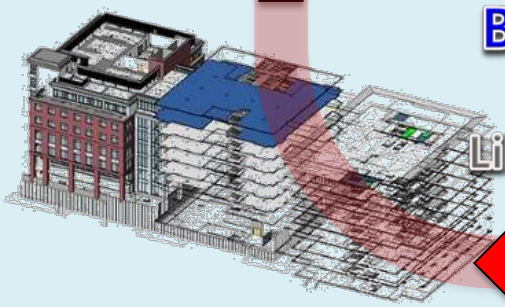
Sensor | Automatic | BEMS...

## IT Convergence



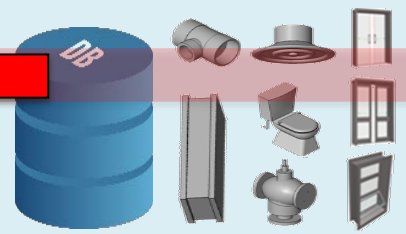

## BIM Modeling

Part 1



Architecture | Structure | MEP...

## Libraries-Technical Contents

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MEP

Structure

Construction

Architecture

Facility Management

IT Convergence

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Classification

Process

Information Spec.

BIM General

BIM Element

BIM Management

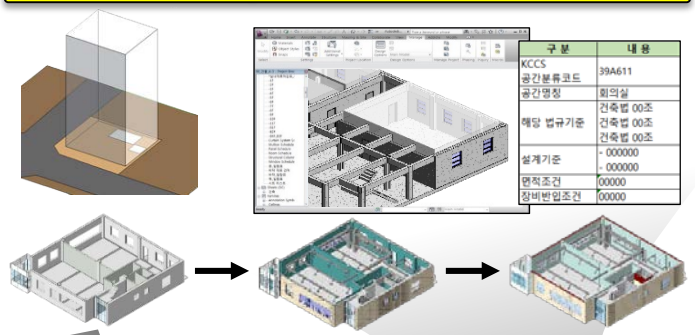
SW and Contents

OpenBIM Standard

BIM Standard Information Framework

1-4

Design Efficiency Innovation Technology based on OpenBIM Platform



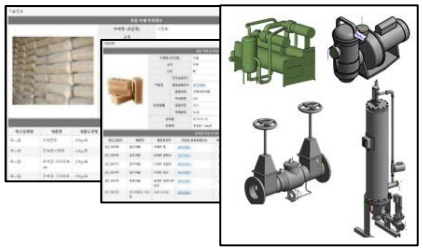
Reflection

Creating BIM Model

Utilizing BIM Model

1-2 1-3

Expansion of Libraries and Technical Contents



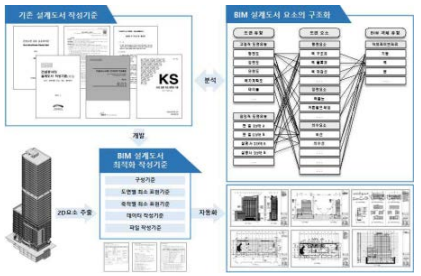
Architectural Design Contents

Construction Industry BIM Contents Repository

OpenBIM Platform

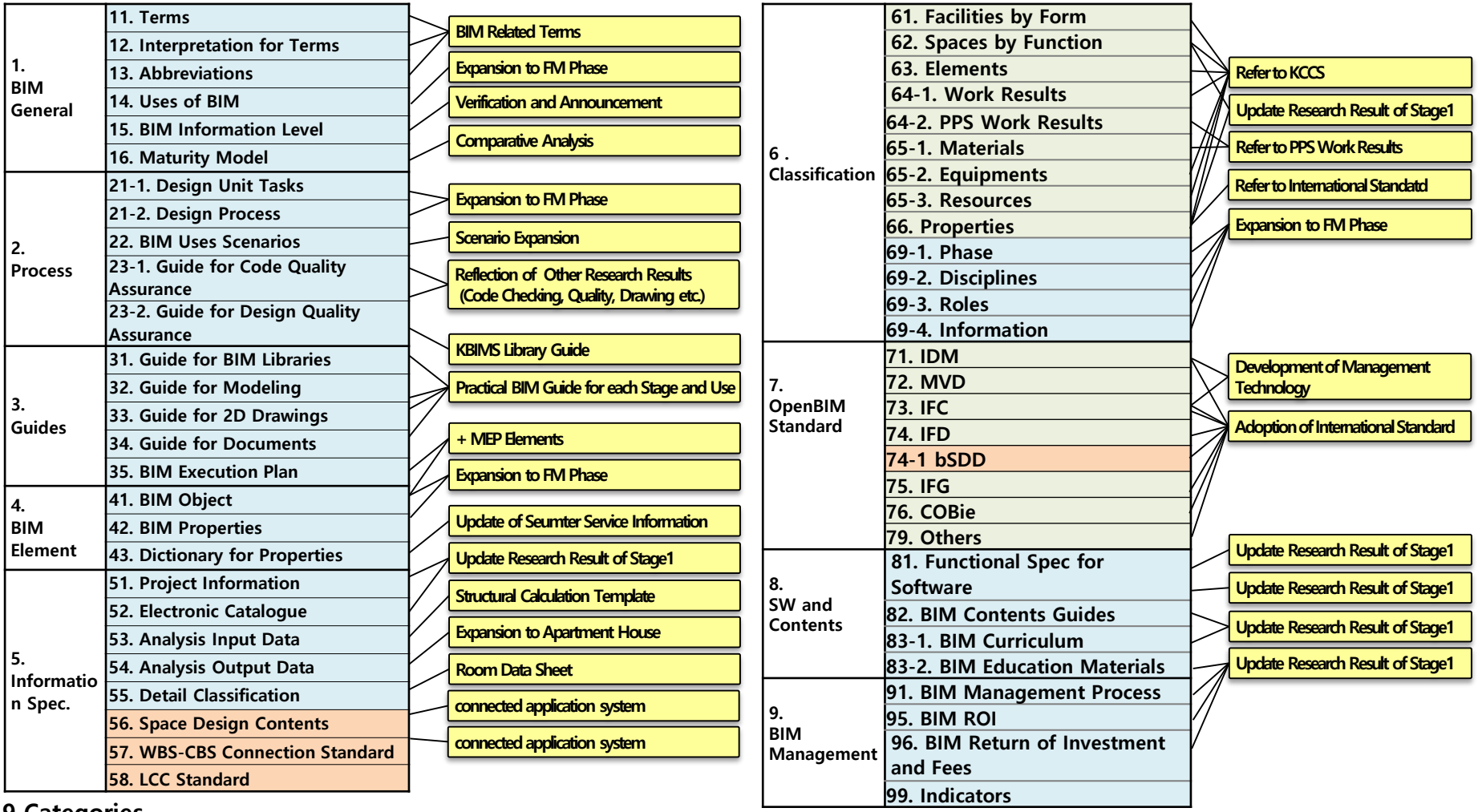
1-5

Efficiency Innovation Technology for CD Drawings



# 1-1 Expansion of BIM Information Standard for IT Integrated Design





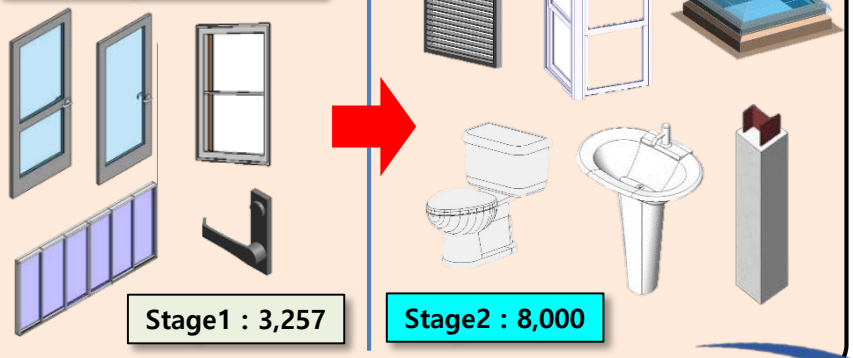

9 Categories,
56 Modules(+α)

| 36 | 4(+α) | 16 |
|---|---|---|
| Supplementation | Addition | Reference |

# 1-2 Expansion of Architectural Libraries and Technical Contents



**Library Development Expansion**

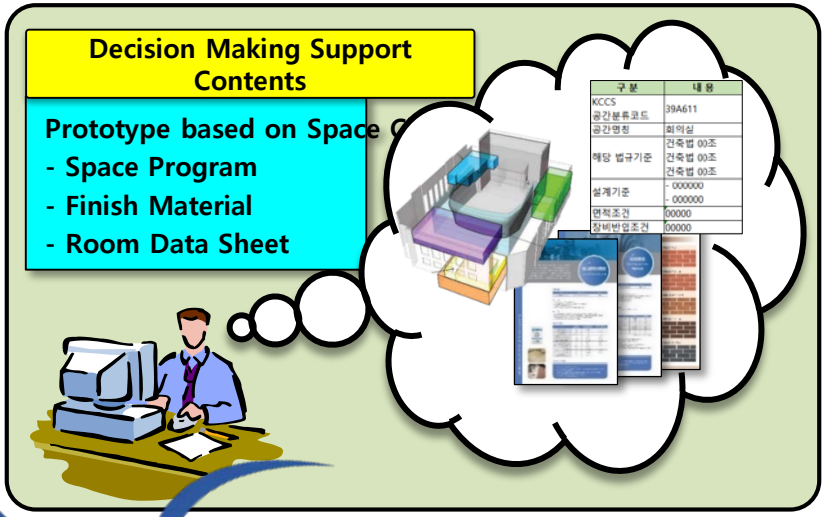


Stage1 : 3,257

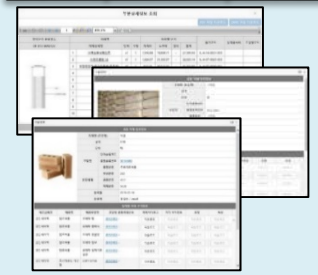
Stage2 : 8,000

**Decision Making Support Contents**

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

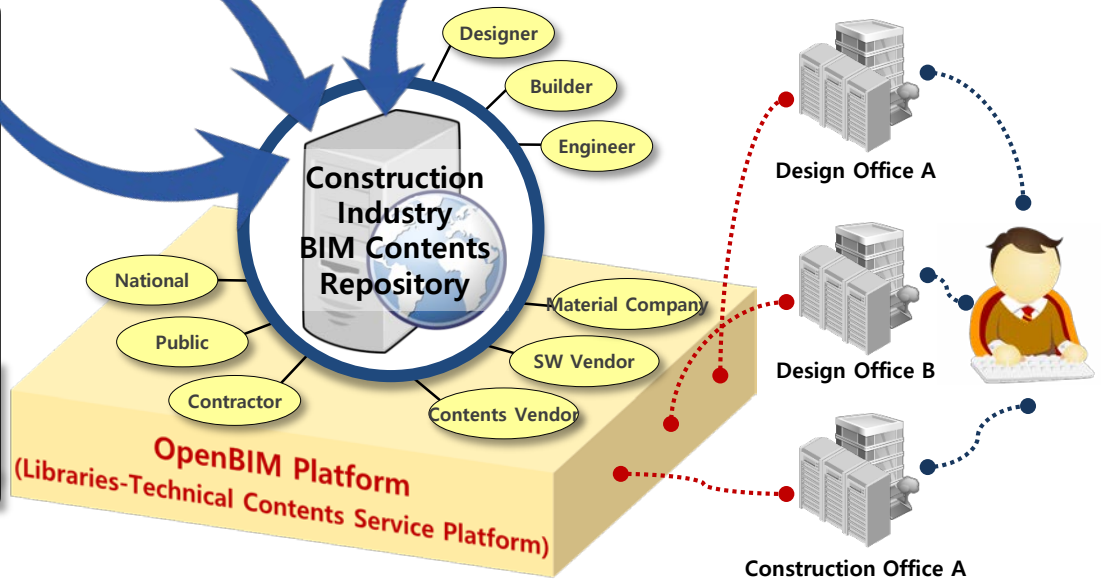


**Technical Contents Development Expansion**



Stage1
- Details : 423
- Cost Information : 755
- Material Information : 2,855

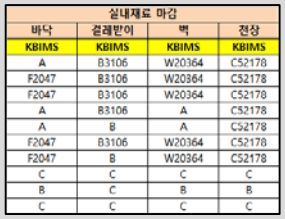

Stage2
- Details : 600
- Cost Information : 1,200
- Material Information : 15,000



# 1-4 Design Efficiency Innovation Technology based on OpenBIM Platform



**Decision Making Tech.-Finishing**

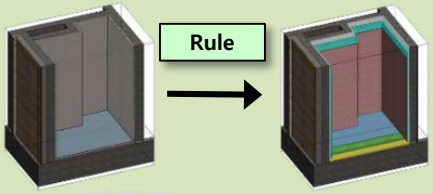


| 실내재료 마감 | | | |
|---|---|---|---|
| 바닥 | 걸레받이 | 벽 | 천장 |
| KBIMS | KBIMS | KBIMS | KBIMS |
| A | B3106 | W20364 | C52178 |
| F2047 | B3106 | W20364 | C52178 |
| F2047 | B3106 | W20364 | C52178 |
| A | B3106 | A | C52178 |
| A | B | A | C52178 |
| F2047 | B3106 | W20364 | C52178 |
| F2047 | B | W20364 | C52178 |
| C | C | C | C |
| B | C | B | B |
| C | C | C | C |

**Decision Making Tech.-Element**

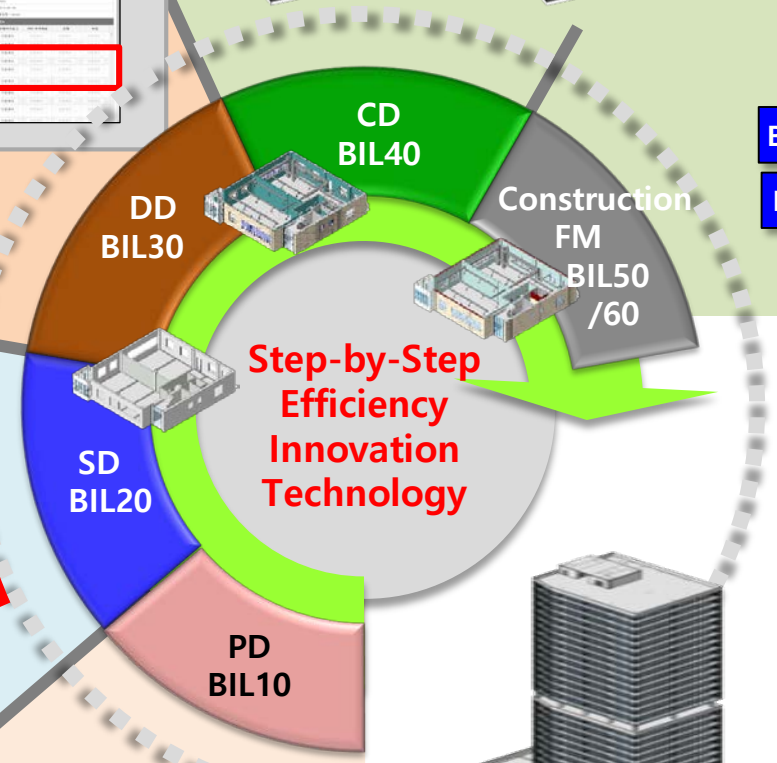
**Decision Making Tech.-Design Requirement**

**Decision Making Tech.-Space Planning**



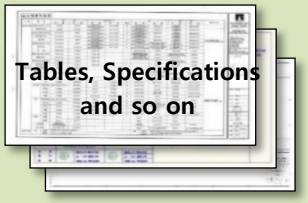

**Object Segmentation of Design Model**

Partially Automaton of CD Level Model base on Specific Rule




**BIM-Design Table Connection Technology**

**BIM-Specification Connection Technology**




**Construction Cost Review Technology**

Rough Estimation

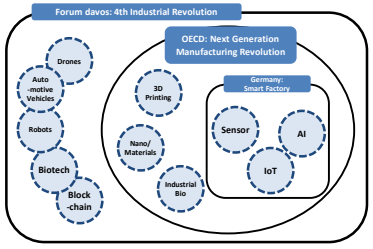
Detail Estimation

# Policies in Korea

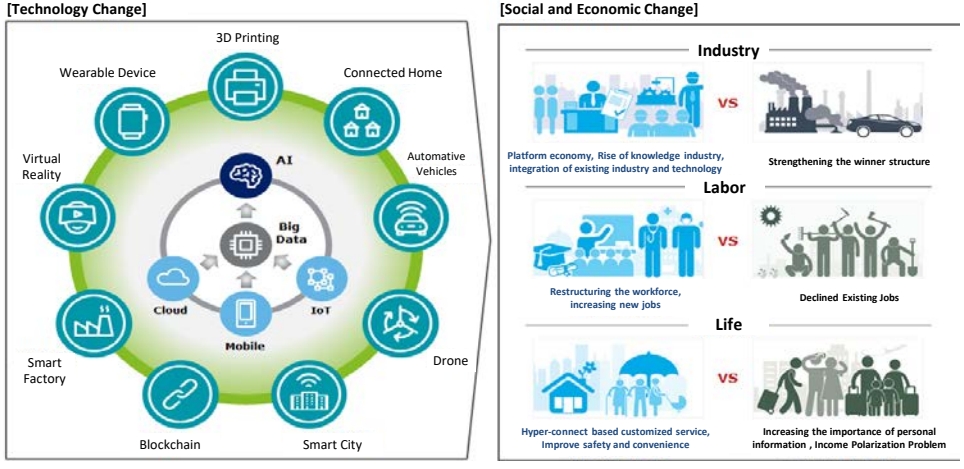
# The 4th Industrial Revolution Strategy

## ❑ 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




### 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 Projet investment and improve management system |
| | ② Open to public of Traffic public data and Support utilization |
| | ③ Innovate Regulatory and Human resourceTraining |

*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

* Building Eenergy 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)*

# The 1st National Transportation Science Research & Development Comprehensive Plan

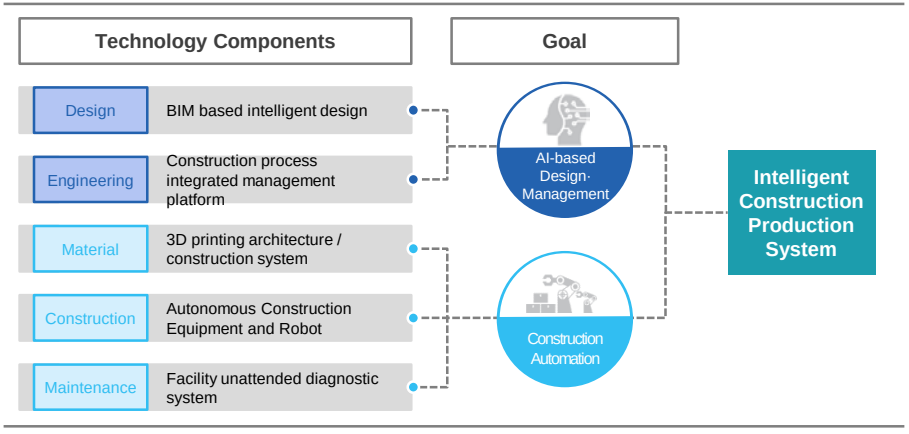
## Strategy 02. Create new value through technology convergence

### 01 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




**AI-based Design·Management**

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** ▸▸▸ 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-> Optimization ->Reduce costs and time by virtualizing 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

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

**Construction Automation**

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

**Construction** ▸▸▸ 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

## Construction Technology Promotion Plan

**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

**Key Task**

| Field | Key Task |
|---|---|
| Technology development | ① Productivity Enhancement through Smart Construction Technology<br>② Development of construction technology for overseas demand |
| Fostering high value-added industries | ③ Interdisciplinary. Strengthen competitiveness through compound<br>④ Foster new business through construction Big Data distribution |
| Strengthen construction safety | ⑤ Construction safety · Environment management |

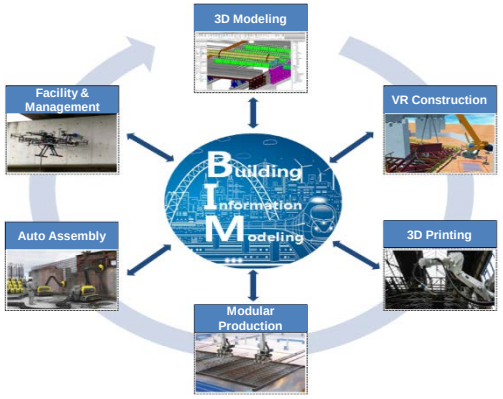
**Key Strategy**

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

**Key Task**

| Field | Key Task |
|---|---|
| Industrial Reorganization· Promotion | ① Strengthen Eng. capacity and support overseas expansion<br>② Make a policy that meets international standards |
| Construction Manpower· Education | ③ Establish a career management system that meets global standards<br>④ Fostering technical manpower having global competitiveness |
| Standard·Policy | ⑤ Technology-driven ordering and enhancing deliberation |

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



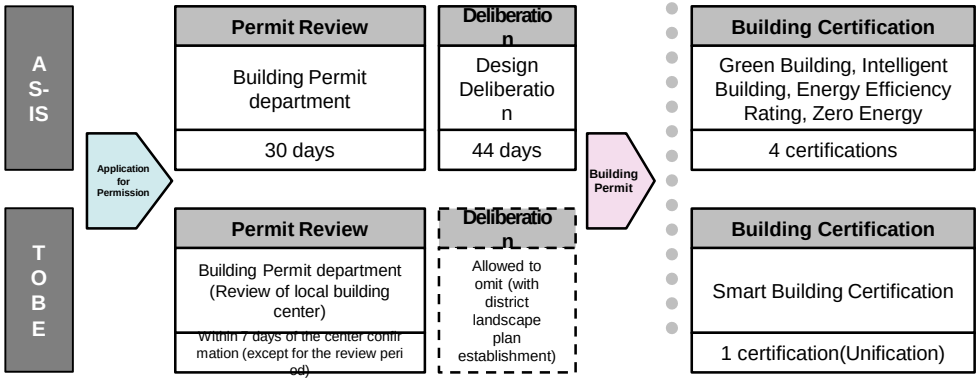

## Smart Construction Automation

- 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

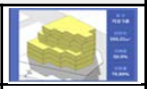
## ❑ Regulation Innovation




## ❑ 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**

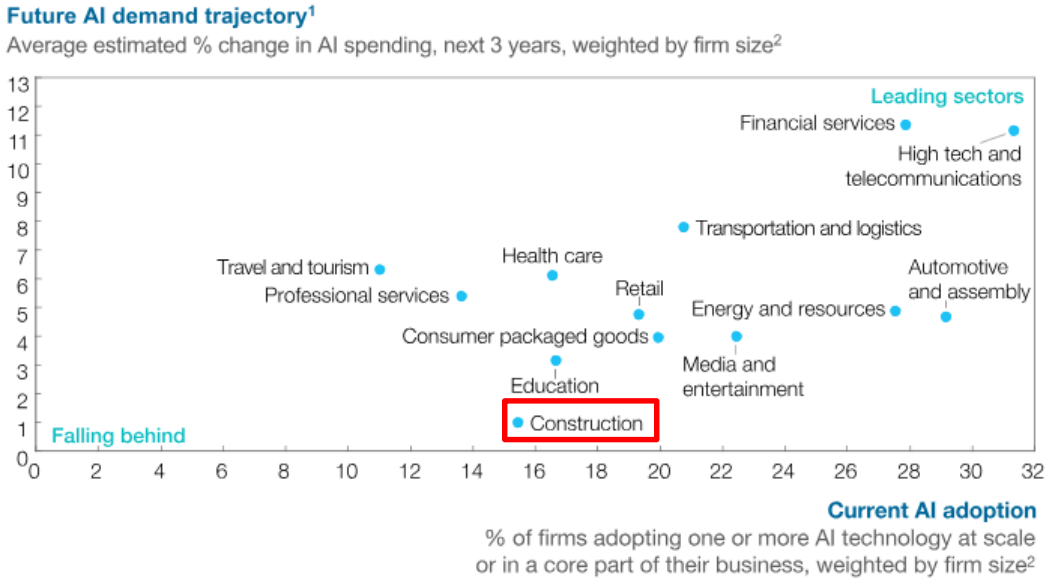
## ❑ Information Innovation

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


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

*Courtesy of KIRA and Italab, KHU (Sejin Lee, Kyung-Eun Hwang)*

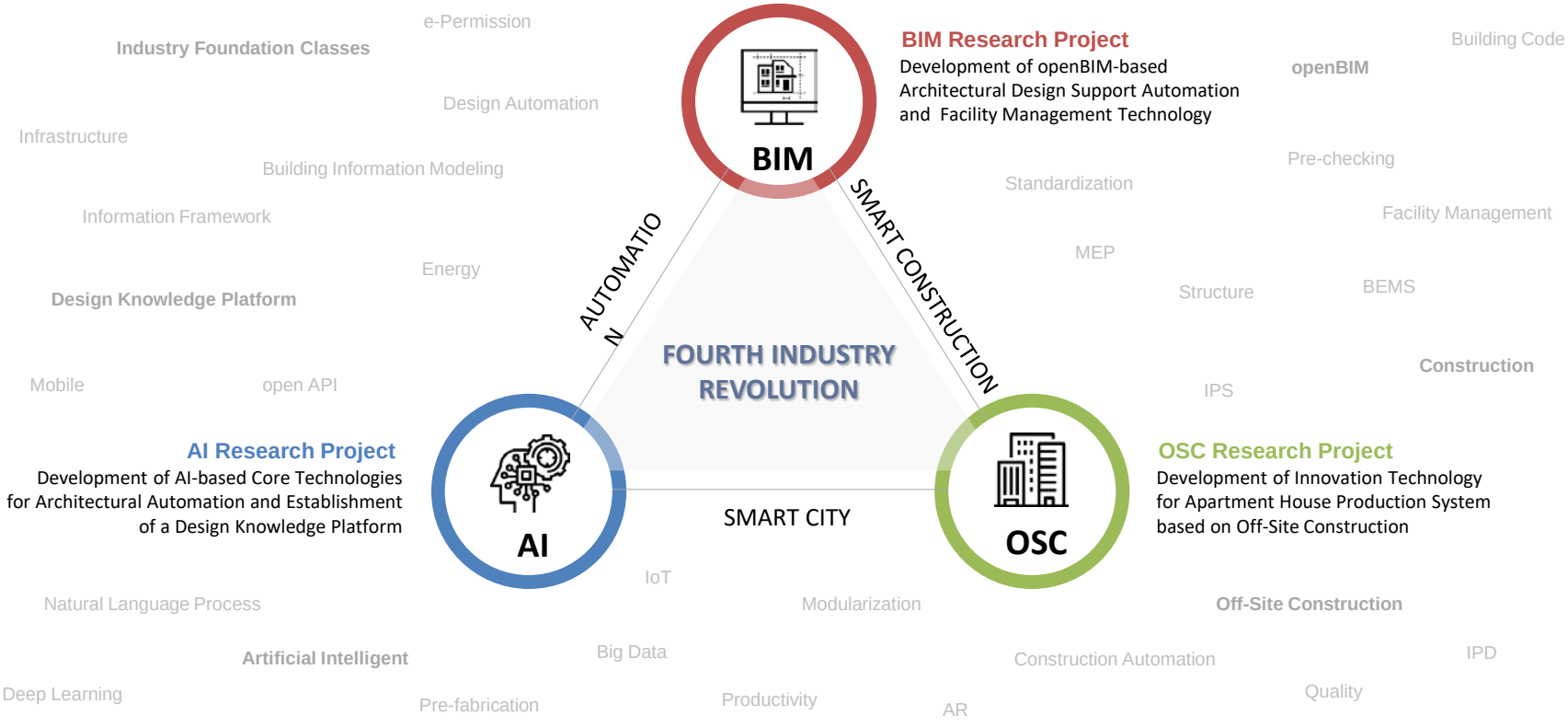
# AI Technology Application Status by Industry




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.
**Source:** Michael Chui, James Manyika, and Mehdi Miremadi, "What AI can and can't do (yet) for your business," *McKinsey Quarterly*, January 2018, McKinsey.com

McKinsey&Company

# Research Projects Overview in Korea

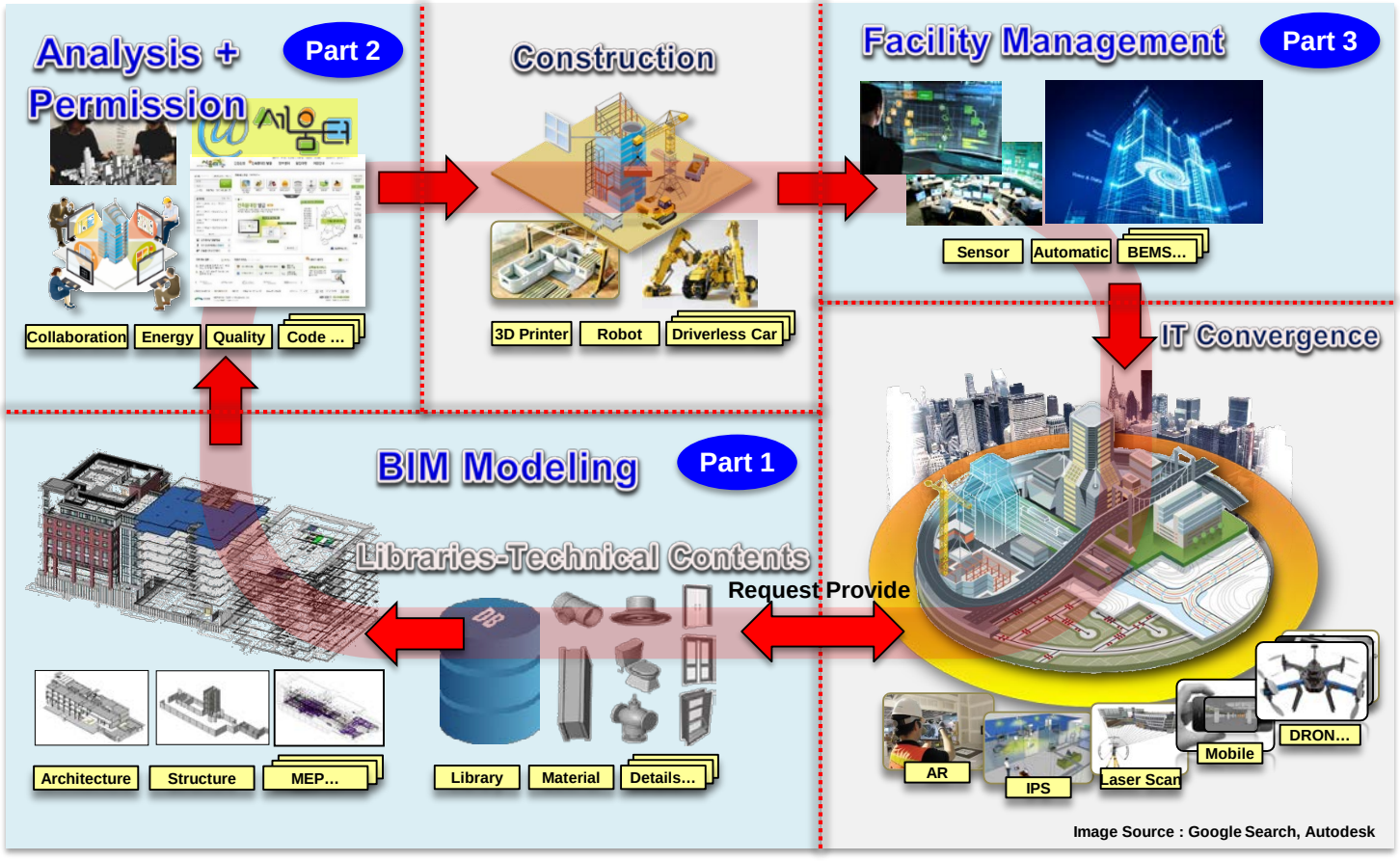



**BIM Research Project**
Development of openBIM-based Architectural Design Support Automation and Facility Management Technology

**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** | • Build a platform to share building design knowledge<br>• Design knowledge advanced design technique through deep learning<br>• Building evaluation and utilization system of alternative design based on artificial intelligence | • Learning algorithm knowledge in the field of integrated design<br>• Building big data for integrated design / construction knowledge<br>• Arrangement system and process for responding to artificial intelligence based architectural design system | • Establishment of design alternatives for decision making step by step<br>• Architectural design process and subject R & R innovation<br>• Developing human resources by accumulating experience in building design based on big data and artificial intelligence |

| Detailed task composition | Creative Design | Efficient Design | High value added design | Sustainable design |
|---|---|---|---|---|
| | To strengthen design capabilities artificial intelligence based design develop alternative technology (Planning - Plan) | Improve design productivity Automation of design for technology development (Implementation - Detailed) | Improvement of intelligent design quality technology development (Design - Construction - Operation) | 4th industry-oriented architecture design services for innovation development of technology diffusion model |
| **Representative Core Technology Elements By Specific Tasks** | Intelligent human object initial application technology | Optimization of architectural / structural design | Design requirements And economics assessment automation | Architectural design artificial intelligence Service platform |
| | Spatial model centering design technology | Detail design / MEP automation | Automated building performance evaluation | Future architectural design consulting model |
| | Form functional design alternatives automatic generation technology | Intelligent information management solution | Constructability evaluation | |
| | Design knowledge learning server construction and utilization technology | Parametric / artificial Intelligence based virtual construction solution | Automated design consistency evaluation | Design automation information standard framework |

**Benefit**

Creating high quality jobs

Architecture design automation localization of source technology

To the world design Market expansion

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