Making Smart Public Space by SIDI
— a Review of Top 100 Design Companies

CHEN TONG, ENJIA ZHANG, YING LONG
5 JAN 2020
0. Contents

- 1. Review process
- 2. Profile
- 3. Cases
Key words: ‘smart’ or ‘digital’

Objects: Projects or Pictures

1. Review process

Numbers of companies

103

21

8

20.4%

7.8%

Source 1: https://architectureworld.com/100-best-architecture-firms-in-the-world/
Source 2: https://www.bdonline.co.uk/wa-100
Source 3: research institutes and technological companies
Source 4: Domestic design companies
Source 5: Twitter
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2. Profile

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1. Aecom

https://www.aecom.com/
@AECOM
P1 Queen Elizabeth Olympic Park

Smart Park / Future Living – Implementing user facing digital and data solutions that deliver financial and CO2 efficiencies and prioritise quality of life improvements for those who live, work and visit the Park.
P1 IoT Sensor

一个由超过1500个传感器组成的网络，用以跟踪与空间环境相关的日光值、占用率、温度及能源消耗。我们的目标是给人留出空间，而不是把人塞进空间。

我们引入了一个额外的占位感知、温度和动作捕捉功能，以更全面地探索我们随着时间变化如何工作、运转和适应空间——最终提高了Gensler在如何将数据应用于人性化设计方面的专业技能。
P2 FLOAT NYC

FLOAT NYC is a passenger cruise on a 105-foot-high buoyant float structure, capable of hosting television and film screenings on its facade.
P3 Digital Experience Design

Gensler’s Digital Experience Design (DXD) practice connects the worlds of physical and digital design by delivering holistic strategies and integrated designs for the built environment.
3. IBI Group

P1 IBI Mobility+
P2 Interactive Installation
P3 Digitally illuminating a city’s utilization

https://www.ibigroup.com
@ibigroup
P1 IBI Mobility+

IBI Mobility+ is a centre of excellence that taps into new technologies and community intelligence to design choice and convenience into the urban journey, enabling a connected future for cities and their residents.
P2 Interactive Installation

Teaching sustainability and energy conservation through play.
P3 Digitally illuminating a city’s utilization

For the Pittsburgh revitalization project, we pumped all the city’s data into a 3D model, which we programmed to illustrate utilization over time on a typical day. As the information changes over time, the data drives animation within the 3D model in forms of color, motion, etc.

How many people are going where?
Which storefronts are vacant? Which are active?
What’s the traffic count through the area?
P1 Smart Mobility
P2 Transforming Visitors to Artists & Performers

8. HOK

https://www.hdrinc.com
@HOKNetwork
P1 Smart Mobility

Emerging transportation technology represents a significant opportunity for infrastructure owners, operators and travellers to experience greatly improved safety and mobility, and reduced congestion. While that’s good news, transportation planners, engineers and system managers need to identify a smart path forward that avoids one-time technology blips when investing in those technologies. Long-term success will depend on implementing the right intelligent transportation systems and emerging technologies that not only improve system operation, but also improve a community’s quality of life.
P2 Transforming Visitors to Artists & Performers

Interactive media is used to organize participant activity.
11. Stantec

P1 Quasyside District Waterfront Toronto
P2 Virtual Infrastructure

https://www.stantec.com/
@Stantec
P1 Quasyside District Waterfront Toronto

The Quayside plan takes AVs, taxi bots, microtransit vehicles, and mass transit into account within its basic framework, making it easier for households to meet their mobility needs. Sometimes called ‘Mobility-as-a-Service’, people in Quayside will be able to plan their trip in real-time via integrated apps and information kiosks.
P2 Virtual Infrastructure

A virtual technology can typically be developed and deployed in a fraction of the time—and potentially have a far greater reach—than conventional physical infrastructure.
12. HDR Architecture

USA

https://www.hdrinc.com/services/architecture
@HDRarchitecture
3. HDR Architecture

P1 Auditon

Interactive installation can play music.
P1 Smart Solutions

15. Sweco

https://www.sweco.se
#sweco
P1 Smart Solutions

Examples of smart city solutions can include everything from smart power grids that balance loads and reduce energy consumption to high-efficiency public transport networks where the routes are optimised with the help of large volumes of traffic data. They can also include automated and resource-conscious waste management and energy-saving lighting that shuts off when everyone has left the office.
P1 Digital Reality
P2 Digital Infrastructure
P3 Smart Ecology
P4 J30 Smart Motorway

UK

16. Atkins

https://www.atkinsglobal.com
@atkinsglobal
P1 Digital Reality

It integrated new technologies, use of data and augmented reality with public space improvements, green strategies and the necessary infrastructure to deliver high speed wifi, bluetooth as well as the more conventional benefits of good street lighting.

To ride the wave of digitalisation we are seeing across industries and maximise these opportunities, we’ll need to adopt a new mindset and developing new capabilities.
P2 Digital Infrastructure

By making use of virtual reality, we can mark out new pipe and cable routes on a virtual twin of the site and then transpose them directly into design software.
P3 Smart Ecology

Over the last 20 years, we’ve seen a move away from identifying ecological impacts at the last minute and then trying to shoe-horn appropriate mitigation into the well advanced, detailed engineering design of a major infrastructure scheme, to a more iterative approach.
P4 J30 Smart Motorway

The design includes the use of Dynamic Hard shoulder Running and All Lane Running (ALR), where the existing hard shoulder is converted into a running lane.
Making Smart Public Space by SIDI

P1 Smart Mobility
P2 Smart City
P3 How Edinburgh is Putting People at The Heart of its City Design
P4 The Nature Conservancy

18. Jacobs

https://www.jacobs.com
@JacobsConnects
P1 Smart Mobility

With the Internet of Things and Industry 4.0 digital revolution challenging planners, cities and their infrastructure owners to make systems smarter and more resilient, while also accounting for future urbanization, we are at a pivotal moment in mobility across markets.
P2 Smart City

The city’s state-of-the-art smart technologies, along with its sustainable infrastructure focused on clean, reusable and recycling methodologies, serves as a model for growing the country’s technological depth in manufacturing, while providing new opportunities for helping people across geographies to compete, collaborate and co-create a better future for all.
P3 How Edinburgh is Putting People at The Heart of its City Design

A “big picture” strategic approach to develop integrated infrastructure — physical and digital — that address multiple considerations.

Being smart is about more than sensors, Wi-Fi hotspots and the Internet of Things (IoT). Smart means using technology to inform strategy, taking an evidence-based approach and developing connected solutions that are focused on improving the quality of life.
P4 The Nature Conservancy

The Nature Conservancy released to the public today, at the peak of the Atlantic hurricane season, a groundbreaking case study that provides a preliminary, comprehensive evaluation of how nature-based defenses, in conjunction with gray solutions, can effectively be used to protect communities in New York City and around the globe from the impacts of climate change.

The Nature Conservancy included installation of vegetation and sediment filled baskets to deter, coil logs filled with rock and coconut fibers, as well as sediment compaction and revegetation with robust clonal species adapted to water depth and energy forces.
<table>
<thead>
<tr>
<th>USA</th>
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<td>19. Skidmore Owings &amp; Merrill</td>
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- P1 Light Cell
- P2 Dynamic façades
- P3 M4 Motor Road
- P4 Urban Farm

https://www.som.com
@SOM_Design
P1 Light Cell

Dynamic light in LED belts reflects connections among different subjects.
P2 Dynamic façades

Dynamic façades made of 148 rotating panels are controlled by coding programs.
P3 M4 Motor Road

Lighting the way for smart city services
P4 Urban Farm

An urban farm in the neighbourhood with a circular energy transformation.
P1 Bridging the analog–digital gap in healthcare

24. Leo A Daly

https://leoadaly.com
@LeoADaly
P1 Bridging the analog–digital gap in healthcare

Many of the most exciting technologies right now bridge the analog–digital gap, bringing human beings and technology together in new ways. Augmented Reality and Virtual Reality (AR/VR) are helping designers better understand their end users.
P1 Smart Functions

Open, light and spacious, the properties have an open plan layout, with residents benefiting from smart functions such as wireless audio systems in the apartments, carpools and charging stations for electric vehicles.
29. Kohn Pedersen Fox Associates
P1 KPFui

KPFui has developed bespoke analysis tools to measure almost anything, from views, to daylight, comfort, sky exposure, solar radiation, wind, energy efficiency, visibility of buildings from/to landmarks, access to parks and transit, mobility, and even subjective characteristics like “visual interest”.
P1 Integral Planning

AUS
34. A+I Architects & Engineers

https://www.kumesekkei.co.jp/en/
Many of the most exciting technologies right now bridge the analog-digital gap, bringing human beings and technology together in new ways. Augmented Reality and Virtual Reality (AR/VR) are helping designers better understand their end users. Internet of Things (IoT) devices are connecting patients and providers. And telemedicine is improving access to care for a variety of populations.
46. ZGF Architects

USA

P1 Ecosystems

https://www.sfmoma.org
@ZGFArchitects
3. ZGF Architects

P1 Ecosystems

Through cooperation and innovation in technology, financing, and strategic integration of all the moving parts and players, cities are scaling towards true sustainability. Just as natural systems adapt and refine functions to stay dynamic, so too must city-systems, which requires the insight of a multi-dimensional partner ecosystem.
47. Arup Associates

- Digital cities
- Hong Kong Smart District
- Human interaction in smart city design
- Sensing Cities
- Autonomous buildings
- The GreenPix media wall
P1 Digital cities

1. Improving public engagement and local governance through digital technology.

2. Buildings no longer need to be stand-alone structures in a city, they can talk to other infrastructure, transport, neighbouring places, and most importantly, people.
P2 Hong Kong Smart District

- 智慧人流管理系统
- 按个人特性及喜好提供的行人能源效率
- 路旁上落货区监测系统
- 智慧回收箱系统
- 多功能路灯
- 实时道路工程资讯
- 违例泊车监察系统
P3 Human interaction in smart city design

Many Thoughts articles identify the value of space to human interaction and the role of grit and chance in making cities attractive. But in a world in which ‘smart’ is the buzz word and efficiency is (rightly) a principle to strive for, we run the risk of losing the opportunity for real social encounters.
P4 Sensing Cities

Sensing City is a world-first project which will see sensors installed in Christchurch to collect real-time information about how a city actually works.
P5 Autonomous buildings

The building may know what you need before you want it, helping to save money and fight climate change — all on its own.
P6 The GreenPix media wall

It performs as a self-sufficient organic system, storing solar energy by day and using it to illuminate the screen after dark.
50. ACXT–IDOM
The city of Guadalajara (the State of Jalisco, Mexico) is promoting the “Creative Digital City”, a plan to renovate the historic centre of the city, creating an interconnected urban environment where creative industries can be set up such as film production, television, video games, digital animation, interactive media, and mobile device applications, to name but a few.
P1 Sounds in Virtual Reality Will Improve Acoustical Design

DEN

71. Henning Larsen Architects

https://henninglarsen.com/
@HLArchitects
P1 Sounds in Virtual Reality Will Improve Acoustical Design

In the new VR lab at Henning Larsen Architects, it is now possible to implement sounds in the mix. When realistic 3D sounds are added, it gives an extra dimension and makes the immersion into the virtual space significantly more convincing. It means that with the technology of the lab and VR goggles on, you can physically move around and experience a fictional acoustics setting.
79. Sheppard Robson

https://www.sheppardrobson.com/
@SheppardRobson
P1 Diagonal

Building on the South Dalmarnock Integrated Urban Infrastructure, Sheppard Robson developed design solutions for some of the key public spaces and pedestrian routes. New streets that meet functional operational needs of vehicle usage, along with safe pedestrian and cycle routes and on road Sustainable Drainage Strategies (SUDs) strategies for adoption.
87. Populous

https://populous.com/
@Populous
P1 The future of sports

- Wearable, data-recoding technology brings fans and athletes closer together.
- The rising popularity of eSports poses the opportunity of creating a physical space for a digital event. Virtual and augmented reality, demountable venues, and smart technology are all factors in bringing eSports to the mainstream stage as a new force in sports.
98. UN Studio

P1 Art Installation
P2 S-Park
P3 A 10 Ring Road
P4 CityTrees
P5 Gateway
P6 Water towers and the turbine kites
P7 Health Patch
P8 Autonomous Vehicle
P9 Lightpole
P10 Shadow
P11 Sensitive light
P12 Solar bricks
P13 Responsive facade

https://www.unstudio.com
@UNStudio_Arch
P1 Art Installation

The city uses interactive installations produced with artists, musicians and students along the riverfront and over the Peace Bridge to improve how people engaged with the space.
P2 S–Park

S–Park is the world’s first system that lets bicycles generate electricity. The technology gives a further sustainable dimension to this modal choice already much admired by many Amsterdammers.
P3 A10 ring road

A new multimodal transport hub located on the intersection between Cornelis Lelylaan and the A10, and new urban development on both sides of the A10 road that link the adjacent neighbourhoods.

- Driverless CityPods
- Micro-scale energy storage and supply centre
- Circularity and efficient energy exchange in order to support and benefit the community surrounding the Hubs.
P4 CityTrees

Amsterdam and Eindhoven planted CityTrees, artificial trees that filter polluted air.
P5 Gateway

Physical architectural interventions that create practical solutions to energy, circularity, mobility, climate adaptation, water management and food production. BLOOM: It harvests and supplies energy, filters water and offers technology to create interactive experiences.
P6 Water towers and the turbine kites

Combined with high efficiency PV arrays they will generate electricity and demonstrate the integration of technique and design.
P7 Health Patch

A wearable patch that is able to provide instant and accurate measurement of stress by checking the levels of Cortisol, the stress hormone, in sweat.
P8 Autonomous Vehicle

Volvo presented its vision on the future of its fully autonomous car, which fits into the broader scheme of city infrastructure, short-haul flights, working commutes, and environmental concerns.
P9 Lightpole

Light serves as both a suggestive tool that influences the flow of pedestrian traffic as well as a wayfinding solution.
P10 Shadow

It is the play between light and shade that manifests visual interest and curiosity.
P11 Sensitive light

Sensitive and precise layers of lighting can generate coherent and enjoyable spaces that encourage human activity.

More intense light can even have the capacity to trigger more intense emotional responses.
P12 Solar bricks

The innovative combination of full colour print and high efficiency photovoltaic material make the Solar Visuals panels smart, efficient and visually attractive at once.
P13 Responsive facade

This is the foundation of a responsive architecture; one that facilitates audience participation and empathic user engagement as essential factors in a healthy society and resilient cities.
P14 International Criminal Court

Interactive infrastructures: With adaptable signs, flexible bollards and connected traffic lights, the zone will react in real time to its ever-changing requirements. With flexible parking lots and curbs, we propose adaptable roads around the neighbourhood. If during an event a road closure is required, a parallel road widens up and takes over the traffic. Sensors will tell us just how successful this redirection is, and will update the road signs and navigation systems in time for the drivers not to notice too much.

- Design for Everyday use
- Design for an Event
- Design for an Emergency
P1 Sensory SURFACE

Ara playing with the sensory SURFACE | stretch COLOR prototype, where pressure applied to the 2D textile determines the color being projected onto the surface.
P2 ENERGY & SPACE

A circular network from power plants to (chemical) industry to greenhouses to city district heating, connected to decentralized thermal energy storages and geothermal sources, would make effective use of our current energy resources.
P3 AR Stadium

Utilizing Augment Reality in sports live.
105.Carro Ratti Associati

P1 Anas Smart Road
P2 Makr Shakr
P3 Digital Water Pavilion
P4 Passage Lumières
P5 Cool Paris
P6 Local Warming
P7 Responsive Flotation
P8 EARTH SCREENING
P9 Cloud
P10 KA Care

https://carloratti.com/
P1 Anas Smart Road

The project involves a pioneering infrastructure system featuring drones that are able to deliver first-aid support, as well as sensing poles that can send useful information to both today’s drivers and tomorrow’s self-driving vehicles.
Through a mobile app, users can browse, design and order an almost limitless amount of cocktail combinations which are then assembled by two shaker-handed robotic arms.
P3 Digital Water Pavilion

An interactive structures made of digitally-controlled water curtains.
Flexible LED strips are suspended a metre above the ground, following the architecture and geometry of the passage.
P5 Cool Paris

The Paris demonstrator showcases 3 different solutions to create 3 different climate modification options, namely: Greenhouse, Coolhouse and Treehouse.
P6 Local Warming

A rank of responsive infrared heating elements are guided by sophisticated motion tracking, creating a precise personal (and personalized) climate for each occupant.
P7 Responsive Flotation

It is a system creating an equilibrium between the user(s) and the level of the water.
In the same way as self-driving cars are expected to revolutionize urban mobility, advanced robotic technologies are reshaping agriculture, with a new wave of innovations helping us to better respond to local terrain conditions.
P9 Cloud

A new form of collective expression and experience, an updated symbol of our dawning age and a new form of observation deck, high above the Olympics.
P10 KA Care

A translucent solar canopy floats ethereally above the inhabited areas, producing vital energy and improving thermal comfort beneath it, threaded with systems and services for nourishing and optimizing the city.
P11 The Slot-based System

A sequential diagram describes how the slot-based system reserves slots around the intersection to secure safety distance as cars travel through.
P12 Dynamic street

The Dynamic Street features a series of hexagonal modular pavers which can be picked up and replaced within hours or even minutes in order to swiftly change the function of the road without creating disruptions on the street.
106.Umbrellium

P1 Footstep energy
P2 Lingue OS
P3 Starling–CV
P4 Pollution Explorers Toolkit (PET)
P5 The Burble
P6 Marling
P7 Assemblance

https://umbrellium.co.uk/
@umbrellium
P1 Footstep energy

Pavegen is a start-up from London that has created a patented flooring technology which converts the kinetic energy from footsteps into off-grid power and data.
3. **Umbrellium**

**P2 Lingue OS**

- On-site server and software platform, control interface

- Built-in interoperability layer, can be configured to control a wide variety of systems using many different protocols (e.g. MQTT, DMX) and data formats

- Integrate with existing systems, custom interactive modes

- Community design engagement sessions

- Optional mobile app for public interaction
P3 Starling–CV

Using a neural network framework, Starling CV tracks objects moving across road and pavement surfaces.

Distinguishes between different types of pedestrians, cyclists and vehicles.

Calculates precise locations, trajectories and velocities.

Predicts near–future paths and speeds of moving objects.

Evaluates probability of various safety and danger conditions.

Optional: interactive road surface.

Optional: Design framework for interactive road, pavement and crossing patterns.
P4 Pollution Explorers Toolkit (PET)

- A series of low-tech wearable tools designed to record a wearer’s perception of AQ
P5 The Burble

- Night-time event and spectacle for thousands of people
- Dramatic interactive Burble structure (usually for one night, or longer periods if necessary)
- Custom interactive app and/or twitter integration
P6 Marling

Night-time event and spectacle for thousands of people

Audio system coupled with high spec laser machine designed for outdoor usage

Highly mediagenic experience that generates a lot of publicity for an event
P7 Assemblance

- Computer-controlled lasers, uses light as a physical material to construct forms in 3d space
- Sophisticated gesture tracking
- Structures are more stable and resilient when built together with other people
- Tourable, requires installation in large dark spaces
107. Google Sidewalks

P1 Automobile Vehicle
P2 加热路面
P3 动态路缘石
P4 模块化路面
P5 地下物流
P6 绿波指示
P7 自行车计数器
P8 Weather Intervention

https://www.sidewalktoronto.ca/
Google Sidewalks

P1 Automobile Vehicle
Google Sidewalks

P2 加热路面
Making Smart Public Space

3. Google Sidewalks

P3 动态路缘石
Google Sidewalks

P4 模块化路面
How it works:
The neighbourhood logistics hub

A tunnel system for 24/7 delivery
Bi-directional freight tunnels could connect directly to buildings, allowing self-driving dollies to deliver packages, carry storage items back and forth, and collect waste.
Google Sidewalks

P6 绿波指示
3. Google Sidewalks

P7 自行车计数器
Google Sidewalks

P8 Weather Intervention
108.DreamDeck

P1 智慧街道改造
P2 海淀科技公园
P3 亮马河国际风情水岸
P5 智慧街道改造
P6 海淀公园AI二期
P7 世园会-海淀科技展园
P8 金融街中央绿化带
P9 海淀小学智能座椅改造

http://www.dreeck.com/
P1 智慧街道改造

智慧交通设施
P2 海淀科技公园

景观管养自动化+灯光互动
3. DreamDeck

P3 亮马河国际风情水岸

灯光水景互动
P4 万科翠柳书院

互动投影
互动水景
3. DreamDeck

P5 智慧街道改造
P6 海淀公园AI二期
智慧垃圾桶
水景互动
灯光互动
3. DreamDeck

P7 世园会-海淀科技展园

重力喷泉互动
3. DreamDeck

P8 金融街中央绿化带

智能跑道
3. DreamDeck

P9 海淀小学智能座椅改造

智慧座椅
Making Smart Public Space by SIDI

P1 Adaptable Bus Stop
P2 Flyfire

109. MIT Senseable City Lab

http://senseable.mit.edu/
@SenseableCity
P1 Adaptable Bus Stop

Incorporates several types of digital technologies in order to offer new services to the public, allow for cost-effective manufacturing, and enable the generation of advertising revenue.
P2 Flyfire

Transform any ordinary space into a highly immersive and interactive display environment.
P1 SMALL CAMPUS 5th generation roads

110. IFSTARR

https://www.ifsttar.fr/en/welcome/
P1 SMALL CAMPUS
5th generation roads

To recharge its battery, there will be no need to stop, to connect and wait for the end of loading. The car can be recharged by rolling with contactless charging systems* on the road surface.

These roads can even produce electricity by capturing the energy of the Sun. Thanks to their black color, they can also absorb heat and use it to heat water. This hot water can then be used in a nearby town.

Connected vehicles will automatically send traffic organization centers information about weather conditions, the number of vehicles around them, and any accidents they encounter. In exchange, the centers will return to the vehicles that circulate in these places messages of speed limitation to avoid traffic jams or adapted weather forecasts (snow, rain, fog).
P1 Ground-level traffic lights

111. Büro North

https://buronorth.com/
@BuroNorth
P1 Ground-level traffic lights

Prompted by accidents involving players of Pokémon GO, Australian firm Büro North has devised a concept for in-ground traffic lights to prevent pedestrians using smartphones from walking out onto the road (+ movie).

The Melbourne-based design agency’s Smart Tactile Paving system would light up in red and green to tell face-down smartphone users when they can cross the road safely.
Thanks!