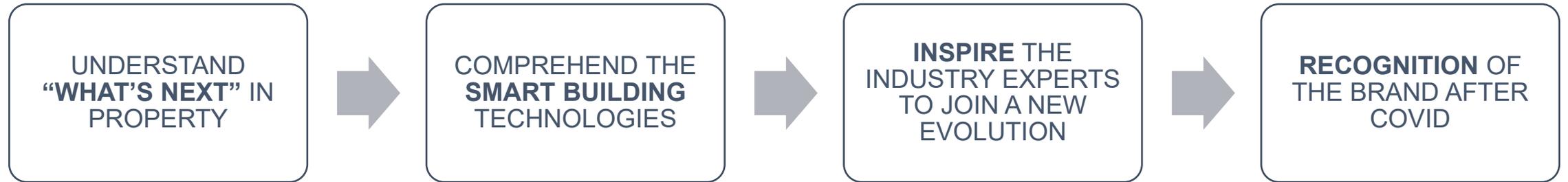


SMART BUILDINGS

AN INTRODUCTION TO THE FUTURE

PURPOSE



CONTENTS

PART I

- WHAT IS A SMART BUILDING
 - DEFINITION OF A SMART BUILDING
 - EXAMPLES OF SMART BUILDINGS
 - SUMMARY OF FINDINGS
- HOW CAN WE DETERMINE A TRUE SMART BUILDING

PART II

- A NEW CHAPTER...

PART I

WHAT IS A SMART BUILDING?

DEFINITION OF A SMART BUILDING

30+ definitions for the term 'Smart' or 'Intelligent' when comes to building:

(1) The **most common theoretical and practical** definition is:

*“smart/intelligent building is any building that provides a **responsive, effective and supportive environment** within which the organization can achieve its business objectives”*

(2) **Intelligent Building Institute (IBI)** of the United States defined as:

*“one which provides a productive and **cost-effective environment** through optimization of its **four basic elements** including structures, systems, services and management and the **interrelationships** between them”*

(3) UK-based **European Intelligent Building Group (EIBG)**, proposed an alternative definition:

*“one that creates an environment which take full advantage of the **efficiency** of the **building’s occupants**, while at the same time enabling competent management of resources with the least possible **life-time costs of hardware and facilities**”*

DEFINITION OF A SMART BUILDING

A **complete** definition that considers all aspects to define a building 'smart':

Key Considerations

“Smart Building is a building that *integrates technology* and process to *create a facility* that is *safer*, more *comfortable* and *productive* for its *occupants*, and more *operationally efficient* for its owners. Advanced technology-combined with improved processes for design, construction and operation-provide a superior *indoor environment* that improves occupant comfort and productivity while *reducing energy* consumption and *operations staffing* that also creates a productive, cost effective and *environmentally approved* environment.”

Integration of Systems



Reduce Energy



Environmentally Approved



Occupiers Friendly*



Increase Productivity



Operational Savings



SMART BUILDING

ORIGIN OF SMART BUILDINGS

Over **35 years ago** – in 1981, US first built **City Place Building** in Hartford Connecticut. Extract from “The New York Times” published in December 1, 1983

Amazingly well before the **world’s first smartphone** which was in 1992 but market debut wasn’t until 1995. It was called the **Simon Personal Communicator**, and it was created by IBM more than 15 years before Apple released the iPhone



EXAMPLES OF SMART BUILDINGS

EXAMPLES OF SMART BUILDINGS

THE EDGE BUILDING (AMSTERDAM, HOLLAND):



KEY FEATURES:

- equipped with some **30,000 sensors** (1 in every 2 SQM ave.)
- uses the data to adapt **how the building functions** based on how the employees within it work, shutting down sections of the building that are not in use to conserve energy
- **keeps a schedule for employees**, giving them instructions of where to go to ensure they are at the right place at the right time
- workers can use smartphones to interact with the building, using an app to **locate colleagues, adjust the temperature or schedule** when they can work out in the building's gym
- also worth noting is the fact that the structure **produces more energy than it uses**
- The Building Research Establishment determined the structure to be the **world's most sustainable**.

EXAMPLES OF SMART BUILDINGS

CAPITAL TOWER (SINGAPORE)

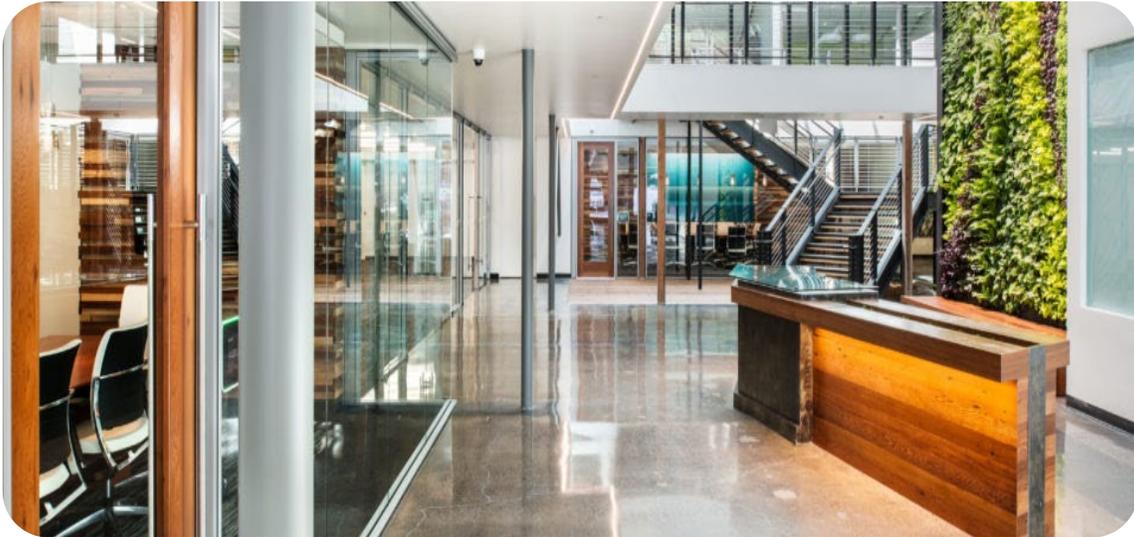


KEY FEATURES:

- The Capital Tower (52-storey) has many smart energy systems which include: an air-conditioning [energy recovery wheel system](#) which allows cool air to be retrieved
- [motion detectors](#) in the lobby and all bathrooms to conserve energy
- [Double-glazed windows](#) that reduce heat penetration and reduce energy consumption
- the [use of condensation from the air-handling unit](#) to reduce water usage, and constant monitoring for carbon monoxide to ensure optimal air quality.

EXAMPLES OF SMART BUILDINGS

DPR CONSTRUCTION (SAN FRANCISCO, CALIFORNIA)



KEY FEATURES:

- Net-Zero Building
- Tricked out [photovoltaic \(PV\) panels](#)
- Rooftop solar [thermal water heating](#) system
- [Electrochromic](#) windows
- 8 solar-powered, automated skylights over an atrium
- Ultra-energy efficient ceiling fans
- 3 living walls and a living wine bar
- [Ultra-low flow and flush plumbing](#) fixtures

EXAMPLES OF SMART BUILDINGS

HINDMARSH SHIRE COUNCIL CORPORATE CENTRE (MELBOURNE)



KEY FEATURES:

- A series of **underground thermal chambers** and a **ventilation system under the flooring** to draw in fresh air from the exterior.
- The earth naturally cools and warms the air and then **redistributes it back through the building interior**.
- LED lighting systems **reduce energy** consumption, and rooftop solar panels harvest energy from the sun.
- Vertical **green walls** enhance the **indoor air quality**.

EXAMPLES OF SMART BUILDINGS

DUKE ENERGY CENTER (CHARLOTTE, NORTH CAROLINA)



KEY FEATURES:

This is a 51-floor skyscraper that boasts the [highest green certification](#) LEED Platinum.

This building is able to [reuse approximately 10 million gallons of water](#) each year—harvested from [groundwater](#), [rainwater](#) and [HVAC condensation](#). This reused water constitutes about 80% of the tower's water needs and 100% of its irrigation needs.

This smart building features:

- A [roof garden](#) which reduces storm water run-off and uses the plants to capture excess heat
- [Daylight harvesting blinds](#) that move with the angle of the sun
- 450,000 LED lights that illuminate the building at night

EXAMPLES OF SMART BUILDINGS

THE CRYSTAL BUILDING (LONDON, ENGLAND)



KEY FEATURES:

The Crystal Building is the [largest permanent exhibit site](#) in the world that's dedicated to the study and creation of sustainable cities and is one of [the most sustainable buildings in the world](#).

- Its [annual heating bill is zero](#)
- It emits 70% less carbon dioxide
- 100% of the [water in its toilets is recycled](#).
- It spends [46% less on energy](#) than any other building of its size
- It [generates its own energy](#) with the use of solar panels and ground heat pumps
- It [collects rainwater](#) to maintain its bathrooms and irrigation system

EXAMPLES OF SMART BUILDINGS

BURJ KHALIFA, DUBAI



KEY FEATURES:

Dubai is a world leader in the smart buildings movement.

The Burj Khalifa already had the impressive distinction of being the **world's tallest building** since 2010, standing 828 meter (2,716 feet) tall with 160 stories

Revamped with the smart technologies (by Honeywell), it's now **one of the smartest and most sustainable** buildings.

- improved **air quality, lighting** and temperature
- the building automation system **relays real-time information to IoT platform** which uses **smart algorithms** to identify anomalies and maintenance issues
- facility managers can use this information to improve building maintenance and asset reliability

Since launching this system at the Burj Khalifa, facility managers have **reduced total maintenance hours by 40%**.

SUMMARY OF FINDINGS:

I have identified **Five (5) Key Factors** from these examples, which are **more or less** exist within these buildings:

- 1) Environmental Impacts
- 2) Energy Efficiency
- 3) Smart Platforms
- 4) Security & Risk Management
- 5) Space Utilization

All these buildings went through **various certification processes** to demonstrate the sustainability and called them 'smart buildings'..



DOES THIS MAKES ALL SUSTAINABLE BUILDINGS ARE “**TRUE**” SMART BUILDINGS?

SUMMARY OF FINDINGS:

Worldwide, hundreds of different certification processes are available and here's a list of top 45 that are recognized internationally:

NONE of them addresses a certification process that is dedicated **ONLY** for **Smart Technologies**

- | | | | | | | | | |
|--|--|--|---|--|--|---|--|---|
| 01

Active House
Denmark 2017 | 02

ARZ BRS
Lebanon 2012 | 03

BCA Green Mark
Singapore 2005 | 04

BEAM Plus
Hong Kong 2010 | 21

Greenship
Indonesia 2011 | 22

GreenSL
Sri Lanka 2009 | 23

GRESB
Canada 2012 | 24

GRIHA
India 2007 | 25

GSAS
Qatar 2009 |
| 05

Berde
Philippines 2009 | 06

BREEAM
United Kingdom 1990 | 07

Built Green
Canada 2012 | 08

CasaClima
Italy 2002 | 26

Home Star
New Zealand 2010 | 27

HPI
Ireland 2016 | 28

HQE
France 1995 | 29

IGBC
India 2009 | 30

KGBC
South Korea 2000 |
| 09

Casa Columbia
Columbia 2017 | 10

CASBEE
Japan 2004 | 11

ÇEDBIK-Konut
Turkey 2013 | 12

DGNB
Germany 2007 | 31

LBC
United States 2006 | 32

LEED
United States 1993 | 33

LOTUS
Vietnam 2008 | 34

Miljöbyggnad
Sweden 2005 | 35

Minergie
Switzerland 1994 |
| 13

EDGE
United States 201 | 14

EEWH
Taiwan 1999 | 15

GBC Brazil Casa
Brazil 2014 | 16

GBI
Malaysia 2011 | 36

NABERS
Australia 1998 | 37

NGBS
United States 2008 | 38

Pearl
Abu Dhabi 2009 | 39

Protocolo ITACA
Italy 2004 | 40

SBTool
Canada 2007 |
| 17

Green Globes
United States 2004 | 18

Green Key
Canada 1998 | 19

Green Point
United States 2003 | 20

Green Star
Australia 2003 | 41

SEED
Pakistan 2016 | 42

Nordic Swan
The Nordics 2009 | 43

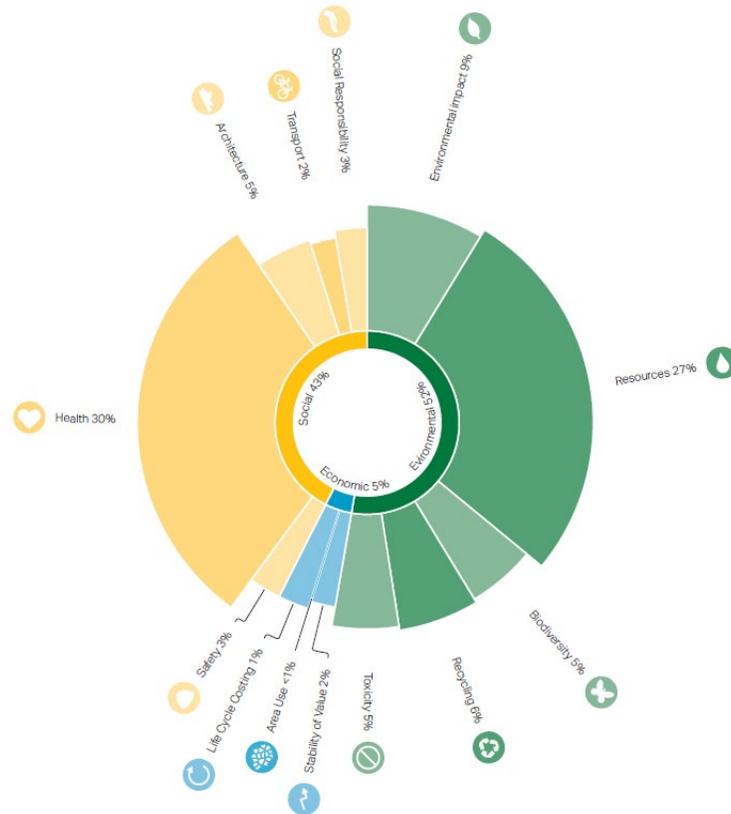
Three Star
China 2012 | 44

Verde
Spain 2002 | 45

WELL
United States 2014 |

SUMMARY OF FINDINGS:

WHAT ARE THE KEY CONSIDERATIONS GIVEN WHEN CERTIFY A BUILDING'S SUSTAINABILITY?



To evaluate the certification systems, their criteria are weighted and placed into **thirteen (13) aspects**. The weighted aspects show how the individual certifications systems focus on the different dimensions of sustainability.

-  (1) REDUCE ENVIRONMENTAL IMPACT
-  (2) USE OF RENEWABLE RESOURCES
-  (3) INCREASE BIODIVERSITY & REMEDIATE CONTAMINATION
-  (4) INCREASE RECYCLING
-  (5) REDUCE TOXIC MATERIALS
-  (6) CALCULATE LIFE CYCLE COSTING
-  (7) OPTIMISE AREA UTILIZATION
-  (8) STABILITY OF VALUE
-  (9) PROMOTE HEALTH & WELLBING
-  (10) QUALITY ARCHITECTURE
-  (11) HEALTHY AND SUSTAINABLE TRANSPORT
-  (12) SAFE BUILDING
-  (13) SOCIAL RESPONSIBILITY

HOW CAN WE DETERMINE A
“TRUE” SMART BUILDING?

PART II

INTRODUCING A NEW CERTIFICATION



**SMART
CERTIFICATION**

COMMON QUESTIONS

WHAT IS THE MISSION OF THE SMART CERTIFICATION CAMPAIGN?

In order to build a **SMART CITY**, first step is to convert or build smart buildings. This campaign is to make Smart Certification a point of reference when that will benefit both the building owners & the occupants which will create a pathway towards our SMART CITY.

WHO WILL BE BENEFITTED?

- 1) Landlords
- 2) Tenants
- 3) Leasing Agents
- 4) Tenant Representatives
- 5) Property Managers

WHAT IS SMART CERTIFICATION?

Smart Certification is a **Key Metrics Assessment** process that creates a 'pathway', developed by a team of industry experts from various level of property backgrounds and backed up by the leading engineers, defined the criteria that makes a building 'smart'.

WHY SMART CERTIFICATION IS NEEDED?

Smart Certification has been developed to **address the digital revolution in the built environment**. The Certification process will assess and will **certify the level of "smartness"** should the building's existing or proposed technologies meet the metrics to quantify their value and contribute to urban environments' overall smartness.

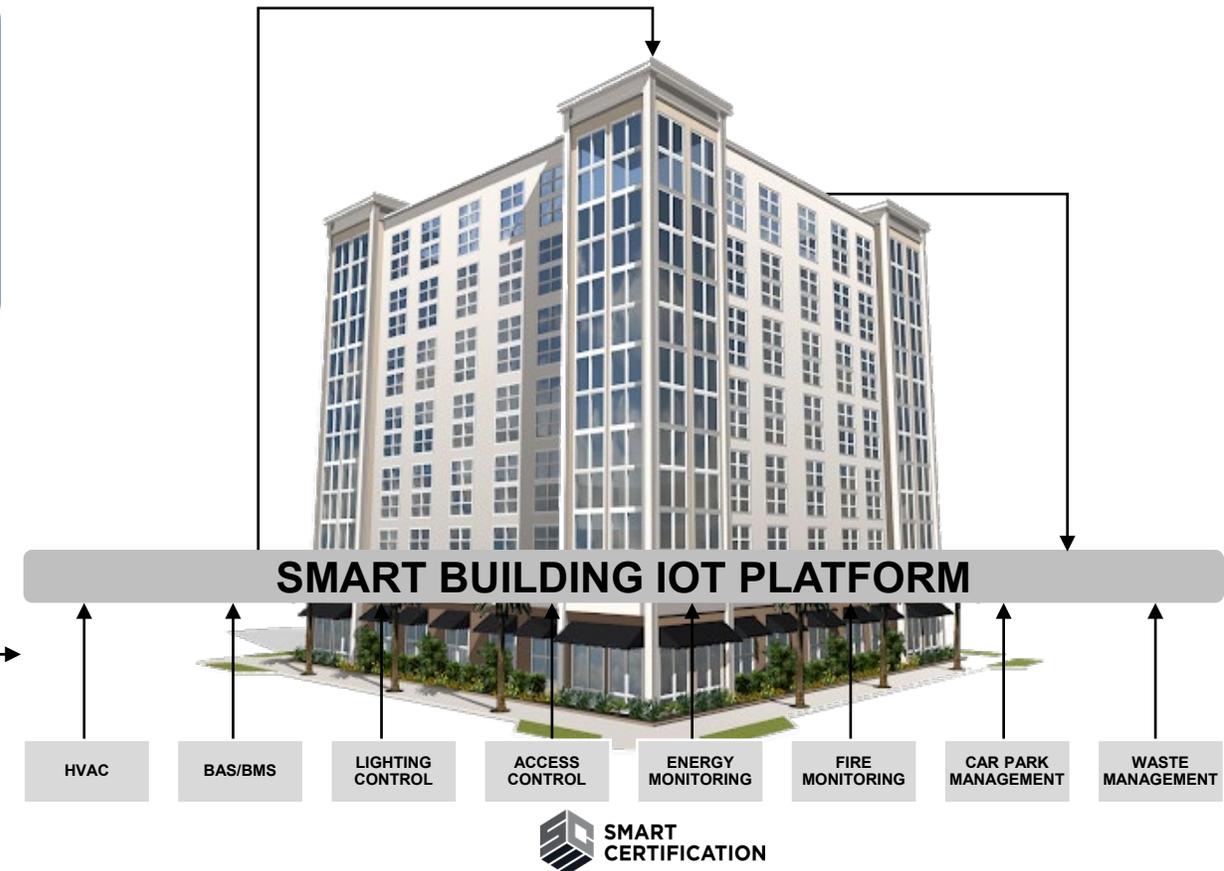
WHAT ARE THE BENEFITS?

- 1) Source the best buildings
- 2) Drive rental value
- 3) Attract & retain tenants
- 4) Streamline tenant engagement
- 5) Streamline tenant due diligence
- 6) Future-proof assets

WHAT MAKES A BUILDING SMART

We have identified THREE (3) main areas that are responsible for a Smart Building's outcome, these areas are:

1. Master Systems Integrator (MSI)
2. Network System Integrator (NSI)
3. Building Management Controls (BMC)



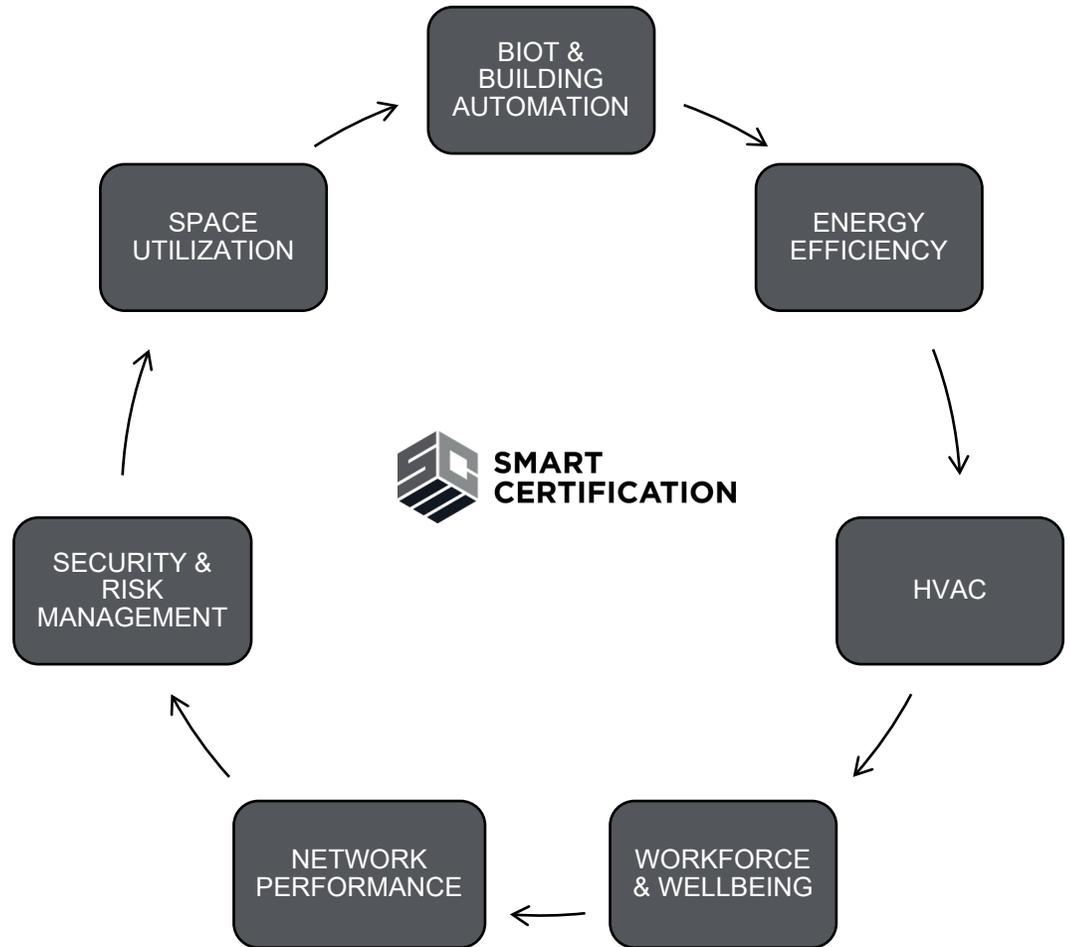
KEY FACTORS FOR SMARTNESS

In order to assess a building's smartness, we have spread MSI, NSI & BMC into further SEVEN (7) distinct zones and created an unique Key Matrices System that creates a **PATHWAY** for the commercial buildings to be considered as 'smart buildings'.

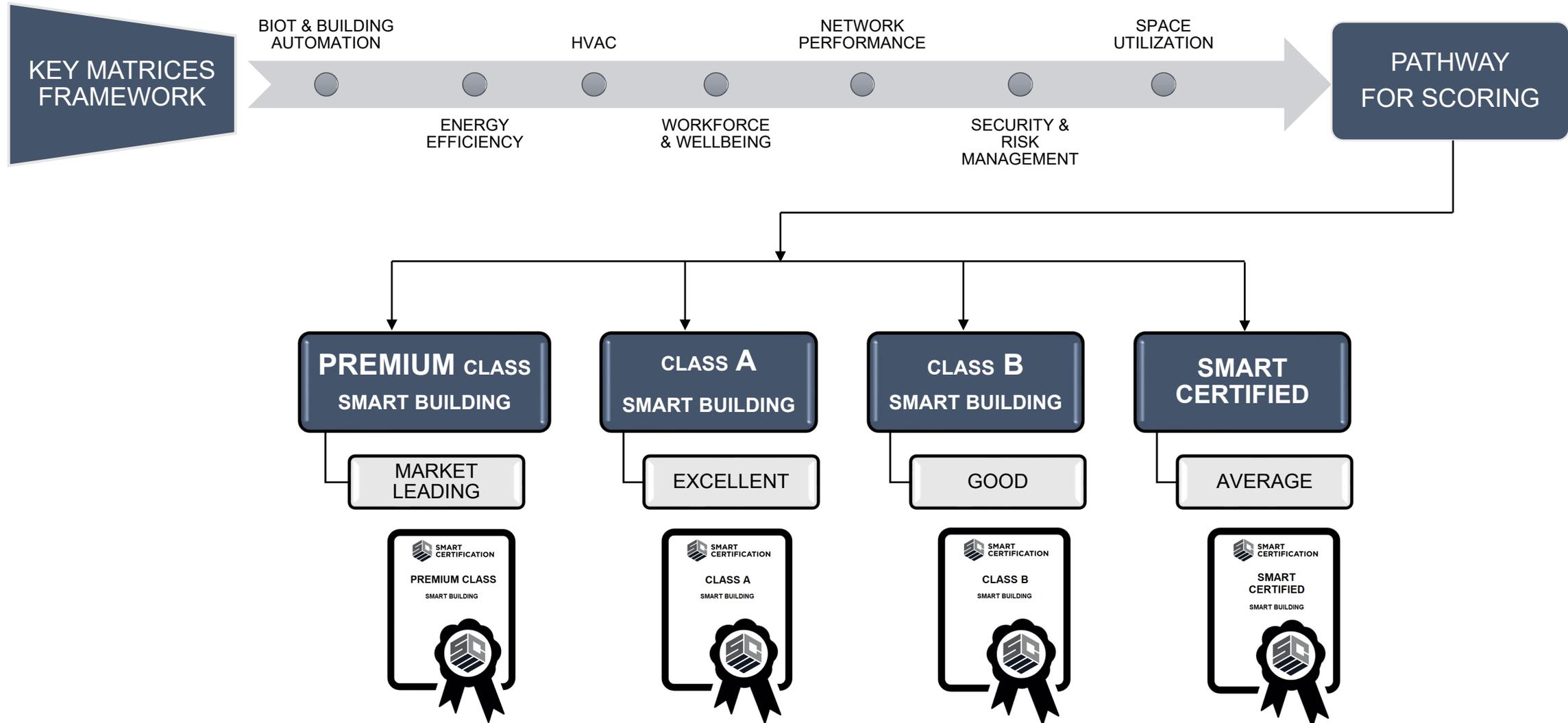
The Smart Certification **PATHWAY** has been developed through an unique Key Matrices framework for quick, comprehensive, and easy assessment of any building.

It can be administered across countries with minimal adaptation.

The framework of the Smart Certification is also flexible and adaptable for future enhancements as applications and solutions for smart buildings continue to evolve.



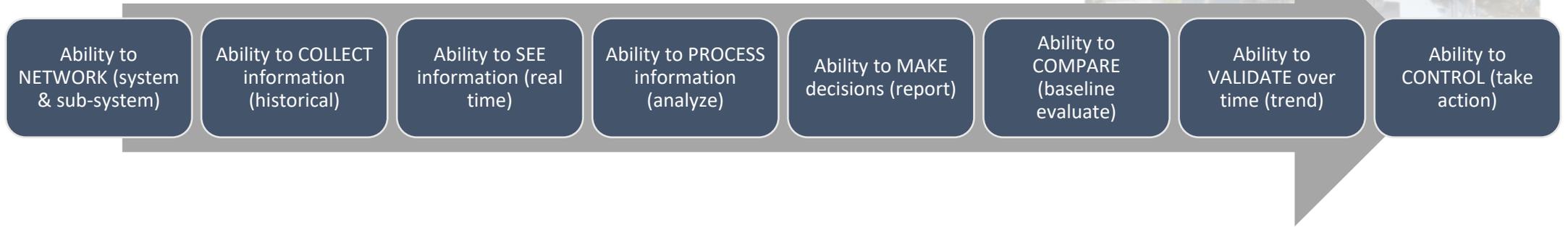
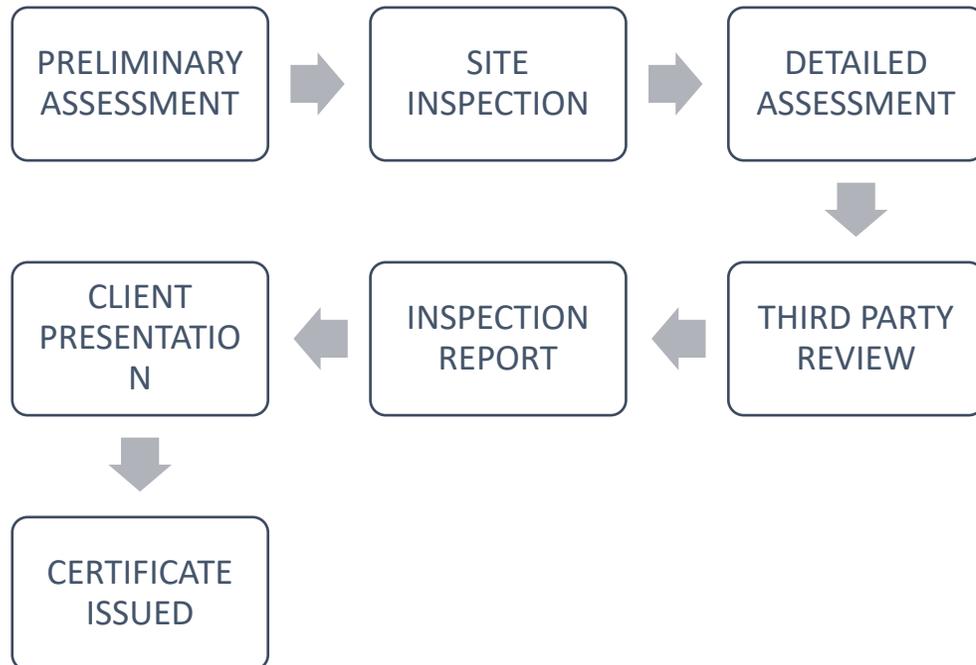
SMART BUILDINGS EVALUATION



Case study

CASE STUDY

1000 LA TROBE STREET DOCKLANDS*



CASE STUDY

1000 LA TROBE STREET DOCKLANDS*

(1) BIOT & BUILDING AUTOMATION

Building will be equipped with Schneider's Ecostruxure System (BIOT Platform) & Smart BMS Analytics

(2) ENERGY EFFICIENCY

NABERS Energy (targeted) 5 Star and Green Star 5 Star

(3) HVAC

Smart heating & cooling system with capacity to include sensors to be connected with BIOT Platform

(4) WORKFORCE & WELLBEING

A proposal for a modern workplace app. 4G WiFi throughout external landscape, onsite gym, etc.

(5) NETWORK PERFORMANCE

Converge Network, smart telecommunication system, high speed network internally & externally, etc.

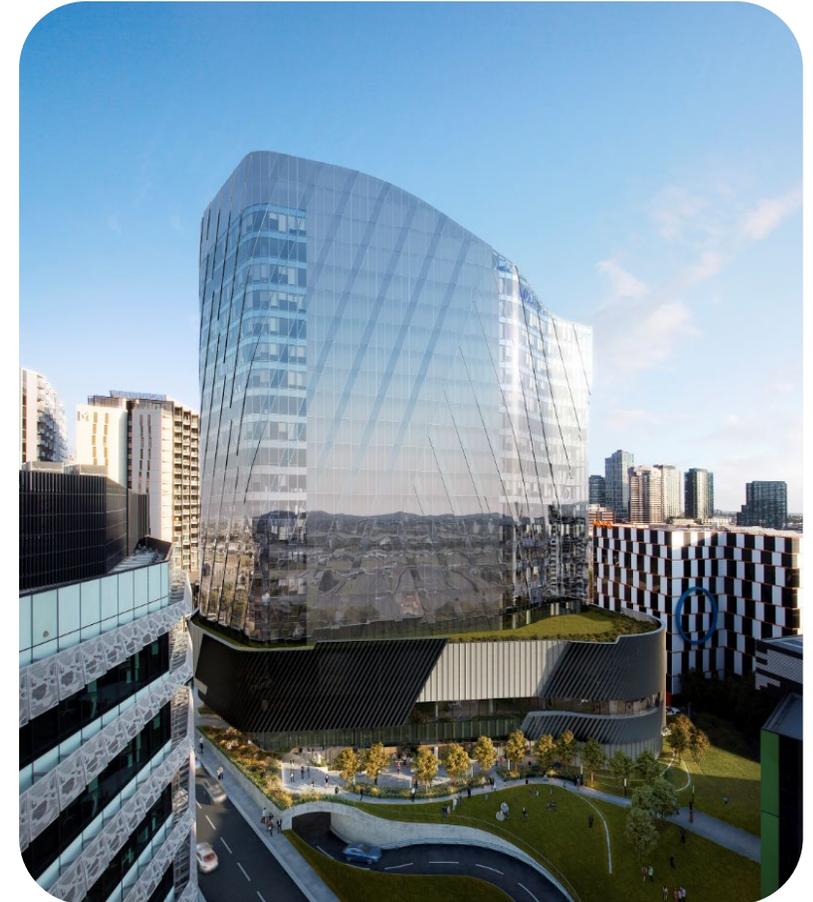
(6) SECURITY & RISK MANAGEMENT

Smart security system connected with BMS, motion detected CCTV, number plate recognition cameras, facial recognition cameras, full time concierge, etc.

(7) SPACE UTILIZATION

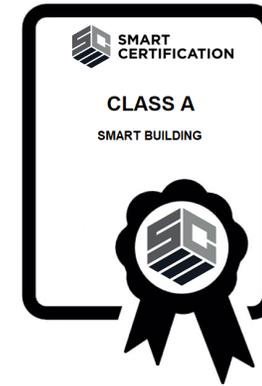
Space and Workplace Management Platforms, capabilities to install sensors within tenancy floors for hot desking, ground floor third space

**high level assumption only*



CASE STUDY

1000 LA TROBE STREET DOCKLANDS

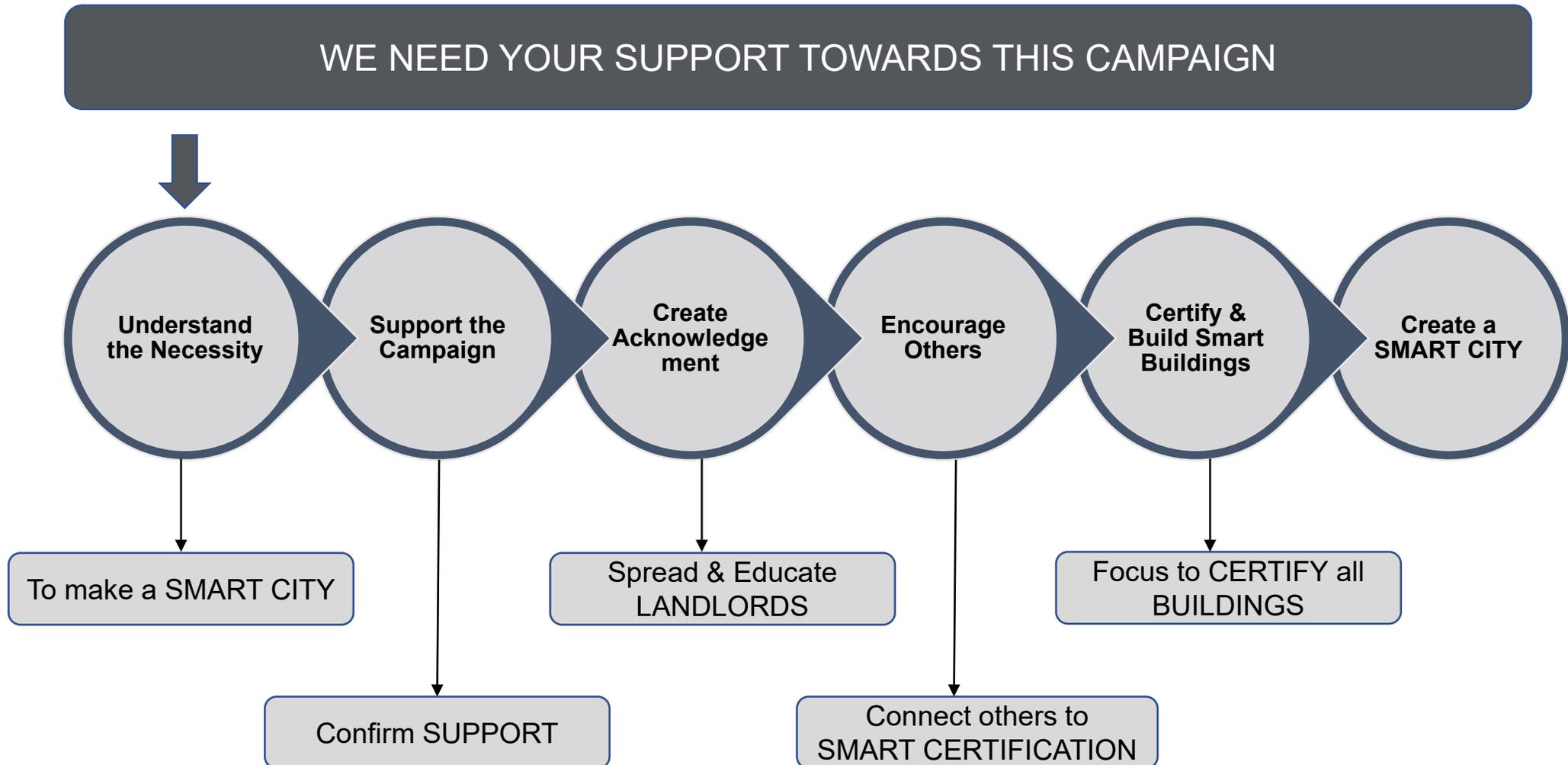


1000 LA TROBE STREET DOCKLANDS

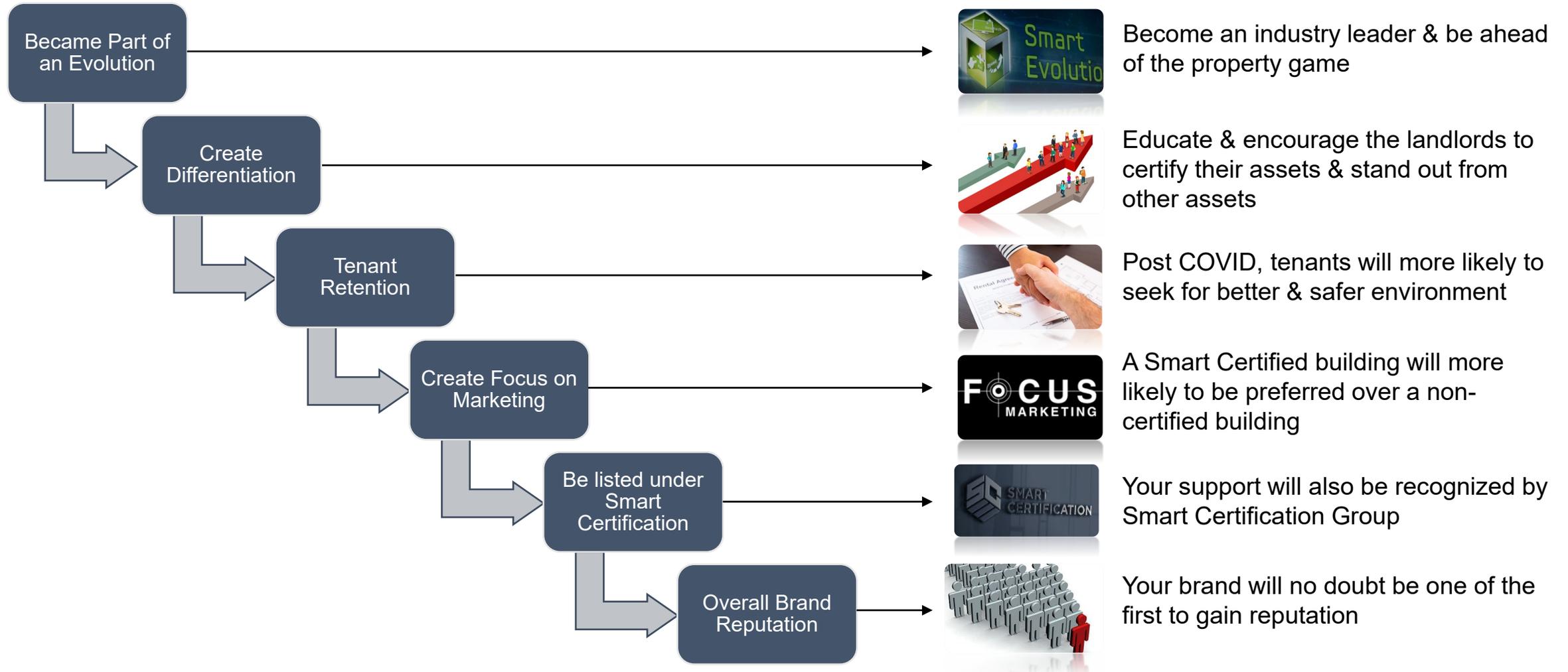
SMART KEY FACTORS	SCORE
(1) BIOT & BUILDING AUTOMATION	20
(2) ENERGY EFFICIENCY	12
(3) HVAC	8
(4) WORKFORCE & WELLBEING	12
(5) NETWORK PERFORMANCE	12
(6) SECURITY & RISK MANAGEMENT	8
(7) SPACE UTILIZATION	<u>8</u>
TOTAL SCORE	80

WHAT'S NEXT?

SUPPORT



BENEFITS OF SUPPORTING THE CAMPAIGN



INTERETED IN JOINING THE EVOLUTION?

SUPPORT SMART CERTIFICATION

(www.smartcertification.com.au)

THANK YOU FOR LISTENING

ANY QUESTION?