A SMARTER TOMORROW: BUILDINGS. CITIES. LIFE.

Middle East



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Executive Summary

Smart buildings make smarter cities

Since the 1970s, the six countries of the Gulf Cooperation Council (GCC) – the Kingdom of Bahrain, the Kingdom of Saudi Arabia, the State of Qatar, the State of Kuwait, the Sultanate of Oman and the United Arab Emirates – have witnessed rapid population growth and economic development brought on by sharp increases in oil revenues. This has led to increased urbanization and the emergence of international metropolitan hubs within the GCC's main cities.

To sustain this development – and in alignment with the region's various national visions and Goal 11 of the United Nations Sustainable Development Goals – increased emphasis is needed on making the region's cities smarter, safer and more sustainable.

A number of GCC countries are launching programs to make their communities and cities smarter. For example, Dubai's Smart City Initiative lays out a defined strategy to ensure it ranks amongst the world's best-connected and smartest cities by 2017. In the past, the demand from buildings was far more straightforward than today, with safety, security and comfort being the main criteria. Conversely, today's drive for greater productivity, connectivity, health and satisfaction is raising the bar for buildings to become smarter and to put the needs of its occupants first.

In effect, smart buildings are a fundamental building block for a smarter city

People spend 80 to 90 percent of their lives in buildings¹, making buildings an integral part of their ecosystem. With the advent of new technologies, the role buildings play is being redefined from a static environment to a more dynamic and interactive space that impacts the lifestyles, well-being and productivity of their occupants.

In our research on this subject, we came across multiple evaluation frameworks for buildings. However, there was no single framework that could be used by all stakeholders such as users, occupants, developers, and policymakers; across countries (most frameworks are driven by industry associations within a particular geography); and comprehensively across the three broad aspects of smart buildings – Green, Safe and Productive.

As technology advances, buildings become more complex. Building operators are faced with rising utility costs that will likely increase in the years ahead – particularly as governments in the region look to reduce water and electricity tariff subsidies.

Powerful new enterprise solutions now help create intelligent buildings that bring many advantages. These include lower costs and improved ROI over the building's life span, optimized performance and functionality, automated monitoring and control, greater occupant comfort, and additional safety and security.

1. Clements-Croome, "Influence of social organization and environmental factors and well-being in the office," in Intelligent Buildings: Design, Management and Operation, Great Britain, MPG Books Ltd., 2004, pp. 63-69.



Green

The green aspect in buildings is well known, and for good reason. The economic and sustainability benefits of green buildings have been proven through extensive academic and applied research.



Safe

The safe aspect in buildings is not equally well-researched or illustrated. It goes without saying that the value of human life and property is of the most importance and should be given the highest priority in any building.



Productive

The conversation around productive buildings is still in its early stages. However, this is the area likely to see the fastest changes, driven by comfort as well as two major megatrends: connectivity and big data. The Honeywell Smart Building Score has been developed to be a universal framework for quick, comprehensive, and easy assessment of any building. It can be administered across countries with minimal adaptation. The framework of the Honeywell Smart Building Score is also flexible and adaptable for future enhancements as applications and solutions for smart buildings continue to evolve. Fifteen smart assets in each building are rated on their Green, Safe, and Productive outcomes, based on pre-defined parameters of capability, coverage, and uptime. We then arrive at the Smart Building Score as an average of the above outcomes.

The Honeywell Smart Building Score was applied for the first time in the Middle East in more than 600 buildings across seven cities, in four countries. Key takeaways from the research are:

Newer is NOT always better

No correlation was found between the smartness of a building and how new it is.

Gap between perceived and actual scores

Across all verticals, building managers and owners perceived their buildings to be much smarter than the actual ranking achieved through the Honeywell Smart Building Score. This suggests there is significant room for improving awareness and understanding of assets amongst building owners and facility managers, many of whom may underestimate opportunities for improvement.

Being safe is a primary concern

Although buildings surveyed received an average Safe Score of 48 on 100 regionally, 70% of building owners and managers believe safety is the most important aspect of a smart building - with upgrades in safety and security being planned for during the course of 2016.

To take part in the Honeywell Smart Building Score survey please visit: http://smartbuildings.honeywell.com/me

City Level Summary

Doha and Dubai lead

Doha and Dubai lead the region in terms of their smart building capabilities across all three categories of Green, Safe and Productive. This is largely attributed to the presence of stronger building regulations in both cities, both past and present.

Voluntary leadership and building regulations are crucial

While on average buildings in Doha and Dubai scored higher than those with less advanced codes, data has shown that each city in the region has voluntary leaders that have applied the high international building standards. Cities are hubs for ideas, commerce, culture, science, productivity, social development and much more.

However, many challenges exist to maintaining cities in a way that continues to create growth and prosperity without straining resources or comprising safety.

The future we want includes cities of opportunities for all.

www.un.org/sustainabledevelopment/cities/



Data Source: Nielsen

Vertical Summary

System integration is lagging

With the exception of airports, every industry vertical across all markets surveyed demonstrated poor integration of their building assets. Integrated building technologies create efficiencies that play a critical role in improving productivity, resource efficiency and safeguarding both lives and property in the event of an incident. Yet 57% of the 620 buildings surveyed had very limited integration across subsystems.

Low asset uptime

'Asset uptime' is the functioning service time of an asset over the course of a year. While investment in smart building assets would improve the score of the verticals, asset uptime is not always fully optimized. While the needs of the building and its occupants largely determine what assets are present and how they are distributed, asset uptime should operate independently from building type.

Given the investment cost associated with assets, it is expected that their operational uptime would ideally be maximized to provide continuous services. However, the average score of asset uptime across verticals is only 68/100. Low asset uptime could be attributed to a number of reasons, including but not limited to:

- Asset quality
- Wiring/system integration of assets
- Maintenance schedules
- Quality of maintenance
- Handling of assets by operators



Why Smart Buildings?

Smarter Buildings Make Smarter Cities

Smart buildings drive economic and environmental benefits, protect human life and building assets and are the fundamental building blocks of a smart city.

Buildings today no longer serve solely as physical structures to shelter their occupants. They increasingly define the quality of life of the people that live and work within them. They stand testament to societal challenges and achievements over time. In the GCC, the next generation of buildings will reflect contemporary global as well as regional challenges. This will include measures to conserve natural resources, and meet rising security and productivity needs.

Why Buildings Should Be Green

Buildings are large resource consumers, and they use around 40% of global energy and emit approximately one third of global greenhouse gases.¹ Therefore they should be as green and environmentally neutral as possible.

Extensive research has shown that green buildings perform better, cost less over their lifetime and make for happier occupants. Some of the benefits of green buildings include:

- Saving water and energy, reducing utility bills for end users
- Streamlining facility management and preventing expensive equipment failures
- Reducing greenhouse gas emissions

Why Buildings Should Be Safe

People spend 80% to 90% of their time inside buildings – their offices, schools or homes.² This makes the need for safety an issue of vital importance.

The main safety priorities are:

- To ensure fire safety for building occupants and assets
- To protect occupants' health and safety through such measures as improved indoor air quality, electrical safety, fall protection and accident prevention

Many GCC government initiatives clearly indicate how the importance of smart buildings has moved up the agenda. Numerous related conferences such as the 'Green Schools' meeting in October 2015 by Kuwait, the Arab Future Cities Summit in November 2015 in Dubai or the Smart Grid Conference in December 2015 in Saudi Arabia demonstrate this. The region's upcoming mega events such as Qatar's FIFA World Cup 2022 or the Dubai Expo 2020 both have substantial smart city components.

- Saving national energy by freeing up natural resources, which can then be used to provide additional revenue generation.
- National savings from reduced power infrastructure investment. (High peak load requires investment in power capacity above baseline requirements. Hence, by offering flexibility in reducing peak load demand, smart buildings allow capital investment savings in power infrastructure)

- To reduce or eliminate the vulnerability of the built environment to hazards (hazard mitigation)

 whether natural disasters or physical attacks – against the building or its occupants
- To prevent unauthorized access to databases and the leakage of protected and private information

Why Buildings Should Be Productive

There is a high correlation between building productivity and occupant productivity. Studies have shown that it is possible to achieve up to 11% gains in employee productivity from improved ventilation and up to 23% gains in employee productivity from improved lighting design.³

Cities drive economies. Unsurprisingly, a smarter, more economically productive city requires smarter and more productive buildings that empower their occupants through:

- Higher revenue generation at company and country level
- Increased economic competitiveness
- Reduced occupant complaints via 'Help Desk' and/or other feedback systems, leading to greater occupant satisfaction and output
- Greater productivity of occupants due to healthier and better-connected environments
- Lower costs per employee, particularly due to reduced absenteeism
- Higher staff retention and reduced staff turnover costs

What Do Building Managers Across The Region Have To Say?

Technology is developing rapidly; building managers can benefit by increasing adoption of new and smarter technologies as they become available. Owners and facility managers find it challenging to keep up with this fast evolving sector. They have mixed feelings about the transformations unraveling in their respective industries and countries.

In interviews with building owners and facility managers on the subject of smart building technology, the majority appear to be focusing largely on security and safety, considering the necessity of upgrades in the coming years. This is further underscored by the fact that when asked why buildings should be continuously improved and made smarter, building managers cited **"to keep buildings secure"** and **"to increase safety"**.

Taking a deeper look, there are clear trends in the GCC which arise for different reasons. The majority of answers citing safety as a leading concern come from Abu Dhabi and Kuwait City. Doha respondents also prioritize safety aspects, but show a higher tendency to relate the technological development of a building with the country's own development. Kuwait City respondents from private offices mention the importance of safety in terms of fire prevention and mitigating the risk of theft. The rationale behind this is straightforward: if employees feel safe and comfortable, their productivity will increase.

Nearly half (47%) of facility and building managers say they are planning upgrades or enhancements in their buildings – predominantly in their camera and security systems, as well as their fire and safety alarm systems, underlining an expressed desire for more safety.

When identifying what they thought were the key criterion that governed their performance in the Honeywell Smart Building Score, building managers mainly cited asset availability (i.e. security cameras). Asset coverage (i.e. how well is the building covered with security cameras?) or uptime (i.e. how often security cameras are not functioning) were not identified as main criteria. This points to an opportunity for continued training as well as increased maintenance efforts.

1. www.unep.org/sbci/aboutsbci/background.asp

^{2.} Clements-Croome, "Influence of social organization and environmental factors and well-being in the office," in Intelligent Buildings: Design, Management and Operation, Great Britain, MPG Books Ltd., 2004, pp. 63-69.

^{3.} W. g. b. council, "World green building council," [Online]. Available: http://www.worldgbc.org/.

Regulatory Environment

The regulatory environment is rapidly evolving in the GCC. Building codes are regularly updated, ensuring that national visions become reality. The survey underscores

the notion that strong safety performance is one important element of the smart cities development agenda. Respondents believe that buildings should be Safe first, then Green and Productive.



Dubai

Dubai is setting ambitious goals. As mentioned, following His Highness Sheikh Mohammed Bin Rashid

Al Maktoum's vision, Dubai has laid out its Smart City Initiative that aims to ensure that it ranks amongst the world's best-connected and smartest cities by 2017. This initiative has three key areas: smart economy, smart life and smart tourism. Focus areas are on mobility, energy, water, waste, solar power, smart grids, e-government initiatives, connectivity, and automation.

As far back as 2011, the Dubai Municipality enacted the "Green Building Regulations & Specification in the Emirate of Dubai" in alignment with its Strategic Plan 2015. These became immediately mandatory for government bodies and optional for private developers. In line with the city's commitment to become a world leading 'green' city and to make Expo 2020 an environmentally sustainable event, Dubai Municipality issued a circular, making the existing Green Building Regulations and Specifications mandatory for the private sector as of March 1, 2014. The Green Building Regulations apply to all buildings in the city, including those in free trade zones. Affected buildings are categorized into one of four fields: villas, public, residential/ commercial, and industrial.



Abu Dhabi

Abu Dhabi launched the first regionalspecific and tailored program in 2010. As a response to the pledge made

in its Urban Planning Vision 2030, the Abu Dhabi Urban Planning Council rolled out 'Estidama' which is a promise to transform the city into a model of sustainable urbanization, by balancing Estidama's four pillars: environmental, economic, cultural and social. The resulting green building rating system, Pearl, was launched in April 2010. Today, Abu Dhabi's Estidama program is mandatory – with a minimum 1 Pearl Rating of all new buildings, and 2 Pearl Rating for government-funded buildings.

Also, in February 2010, Abu Dhabi Occupational Safety and Health Center (OSHAD) was established to ensure the implementation of a comprehensive and integrated management system for occupational safety and health (OSH) and to oversee all OSH issues at emirate level, with the aim of ensuring a reduction of incidents, injuries and illnesses and the provision of safe and healthy workplaces.

The UAE Fire and Life Safety Code of Practice, which was originally released in 2011 and which is currently under revision, recommends minimum requirements for life safety and fire safety design and installation in the UAE. In its more than 700 pages, it provides detailed requirements aimed at minimizing the risk of fire and injuries.



Qatar

In order to create a sustainable built environment that minimizes ecological impact while addressing the

specific regional needs and environment of Qatar, the Gulf Organization of Research & Development (GORD) teamed up with the T.C. Chan Center for Building Simulation and Energy Studies at the University of Pennsylvania to release the Qatar Sustainability Assessment System (QSAS) as a green building certification system in the State of Qatar. In March 2010, the Qatar Ministry of Environment mandated that all schools, mosques, hospitals and government buildings must implement the standards laid out by QSAS. Currently, the system has gone global as the Global Sustainability Assessment System (GSAS). Also since 2009, the Qatar National Vision 2030's environmental pillar of sustainable urban development has been adopted by the Qatar Green Building Council (QGBC), a member of Qatar Foundation for Education.

Qatar utilizes a set of internationally-proven building safety codes for the approval of blueprints. In order to develop its own fire codes as well as to train Civil Defense staff, Qatar is supported by the international non-governmental organization, the National Fire Protection Association (NFPA).



Kuwait

The National Committee of Building Codes of Kuwait (NCOBC) was established by the Council of

Ministers' Decree #1145, dated August 16th, 2010. The committee plans to draft its own codes following a rigorous review of leading international and regional 'green building' codes such as Leadership in Energy & Environmental Design (LEED), Building Research Establishment Environmental Assessment Methodology (BREEAM), Estidama, and Global Sustainability Assessment (GSAS). While Decree 1145 established the NCOBC to develop a Kuwait Code, no targets, commitments or intermediary regulations have been placed on existing or new buildings. The concept of green buildings is still in the early stages within Kuwait's construction sector compared to neighboring UAE, Saudi Arabia and Oman. Intensive support from both government and private sectors is required to implement the concept, strengthened by effective governmental policies and legislations to ensure 100% implementation in future projects.

In context of construction activities, Kuwait has passed several Safety and Health related legislations, covering Occupational Health & Safety, Fire Safety and Safety specific to construction activities.



KSA

A Saudi Arabian Royal Decree in 2000 resulted in the creation of a national committee (SBCNC) to

develop a national building code for the country. A number of base codes were studied including codes from the US, Australia and Canada, along with European and Arab codes. Ultimately, the SBCNC chose to adopt the International Code Council (ICC). The code aims to achieve public health and building safety by setting fire prevention and energyefficient construction guidelines that reduce the impact of natural and man-made disasters. It covers a broad range of guidelines – architectural, structural, electrical, energy efficiency, mechanical, sanitary and fire safety, as well as regulations for existing buildings.

In the Kingdom of Saudi Arabia, legislation on occupational health & safety is mostly included within the Labor Code and Social Security legislation. Other enactments that contain some occupational safety and health provisions include the Rules of Implementation for the Control and Regulation of Labor Inspection Activities of 1970 and more recently the Minister's Labor Decree No. 159 of 2009, establishing a chart of occupational diseases in the Kingdom.

Evaluating a Smart Building

The goal of the Honeywell Smart Building Score framework is to provide stakeholders of the built environment – from users and occupants to developers and policy makers – with a single framework to evaluate buildings across countries covering the established criteria of what constitutes a smart building: Green, Safe, and Productive.

Throughout the development, multiple other evaluation frameworks were taken into account: the Asian Institute of Intelligent Building, Building Research Establishment, Continental Automated Building Association, Intelligent Building Society of Korea, Shanghai Intelligent Building Appraisal Specification, Shanghai Construction Council, Intelligent Building Assessment – Architecture and Building Research Institute, and Leadership in Energy and Environmental Design (LEED) green building rating system.

While LEED is prominent in the GCC, local standards have taken hold, such as the previously discussed Estidama in

Abu Dhabi, and GSAS in Qatar. All such initiatives focus mainly on the impact related to green technology and some aspects of comfort (productivity). A full review and analysis of each of these evaluation frameworks has led to the conclusion that it would be useful to have a comprehensive and simple framework to drive smart building assessment and improvement.

As a result, the Honeywell Smart Building Score was developed as a universal framework for the quick, comprehensive, and straightforward assessment of any building. It can be administered across countries with minimal adaptation. As mentioned, the Honeywell Smart Building Score framework is adaptable for future enhancements as applications and solutions for smart buildings continue to evolve.

Honeywell Smart Building Score

The Honeywell Smart Building Score is a comprehensive scoring system that assesses buildings' assets across three categories - **Green, Safe** and **Productive.** The score covers 15 assets, each of which is made up

of three components - the **asset capability**, the **asset coverage**, the **asset uptime**.

Here we consider – for evaluation-only – active components of a smart building (devices/equipment or software, all



Green

Assets that enable the building and its occupants to conserve natural resources



Safe

Assets that enable the building and its occupants to be safe and secure



Productive

Assets that enable the building and its occupants to be productive

referred to as 'assets' hereafter), as their performance can be improved through better maintenance, operations or upgrades. The passive components (architectural design, building location, building materials) once constructed rarely change much, and hence we have not considered these in scoring. These considerations make the Honeywell Smart Building Score relevant for both new and existing buildings.



Asset capability

The presence of an asset and its ability to perform the intended task



Asset coverage

The spatial coverage of an asset's service over the building

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Asset uptime

The functioning service time of an asset over the course of a year



Honeywell Smart Building Score

Framework

3 Categories	15 Assets	3 Components
Green	4 Assets	Asset Capability
Safe	6 Assets	Asset Coverage
Productive	5 Assets	Asset Uptime
Examples		
Green	1. Do sys 2. Wh cov Flexible Cooling & Heating	es the building have an HVAC tem? at percentage of the building is vered by the HVAC system? w often does the HVAC system stop rking?
Productive	1. Is V 2. Ho Wi- 3. Ho ser	Vi-Fi available? w well is the building covered with -Fi access? w often is the downtime for Wi-Fi vices?
Safe	1. Do sys2. Who cover3. Ho sys8. Notification	es the building have a fire detection tem? lat percentage of the building is vered by the fire detection system? w often does the fire detection tem stop working?

Fifteen Assets Areas Covered By Honeywell Smart Building Score



Honeywell Middle East Smart Building Survey

As previously discussed, in order to assess building assets across the four countries and seven verticals using the Honeywell Smart Building Score, we determined a sample size of 620 buildings. The building samples were collected by parceling out the seven cities analyzed and randomly sampling a specified number of buildings within each parcel, ensuring proper representation for each city, country and vertical. face interviews with building facility directors, security directors, building owners, building managers, or other people responsible for the building's management who are familiar with its assets.

The data from the 620 buildings were then aggregated and analyzed by EY through multiple lenses to extract meaningful insights.

Using the Honeywell Smart Building Questionnaire, research data was acquired by Nielsen through face-to-

620 Buildings In 4 Countries



Lenses Of Analysis



Assets





Public vs. Private



Building Component



Building Certification

Regional Analysis

Score By Category

At a regional level, the score between Green, Safe and Productive is fairly uniform. However, greater variation is evident at country level.

Qatar ranked the highest in all categories, followed by the UAE. This is likely explained by the presence of stricter building regulations and higher competitiveness driven by mega-events such as FIFA World Cup 2022 in Qatar and Expo 2020 in the UAE

Score By Component

Asset capability scored the lowest in the region, followed by asset coverage.

It is worth noting, however, that it is often the needs of the building and its occupants that determine what assets are required and how they are distributed. Consequently, some building types illustrate low asset capability scores given their low need for certain assets (i.e. cargo screening at retail vs. airports). This likely contributes to the relatively low average score of asset capability.

This suggests that buildings within the region can become significantly smarter with greater investment in building assets such as smart systems, gas and water leakage detection, health and safety, natural resources and emergency power systems. While the needs of the building and its occupants largely determine what assets are present and how they are distributed, asset uptime should operate independently from building type.

Given the investment cost associated with assets, it is expected that their operational uptime should be

Honeywell Smart Building Score by category



maximized to provide continuous services. However, the average score of asset uptime across verticals is only 68/100. As we identified earlier, this can be attributed to a number of factors, including but not limited to: lower asset quality, poor wiring/system integration of assets, less frequent maintenance, lower quality of maintenance and improper handling of assets by operators.

In terms of regional variation, Qatar outperformed the rest of the GCC in asset capability and uptime, while the UAE ranked the highest in asset coverage.

Honeywell Smart Building Score by component



Score By Building Age

The surveyed buildings had a wide age spectrum, ranging from 1 to 40 years. No correlation was found between building age and the Honeywell Smart Building Score, at neither the country nor the vertical level. This is likely explained by the fact that the index focuses on active elements of the building, opposed to passive elements, which are more linked to age and initial construction. In general, assets can be easily installed and/or replaced and as such they are independent from building age.

Score By Assets

At both regional and national levels, the top ranking assets were fairly distributed between Green, Safe and Productive. They were also fairly consistent across all countries.

Honeywell Smart Building Score 15 assets



Score By Public Vs. Private

The survey findings suggest that on the Honeywell Smart Building Score public buildings, on average, outperform private sector buildings. This aligns with the global trend of higher standards being rolled out for government and public buildings - serving as benchmarks and best practice to the private sector.

The notable exception to this trend is Qatar, which has private sector buildings outperforming those in the public sector. However, this might be explained by the higher number of private sector buildings surveyed, the overall score is close to that of the private sector.

Honeywell Smart Building Score public vs private



Data Source: Nielsen

Score By Green Building Certification

Certification schemes play an important role in raising the benchmark of smart building infrastructure. 22% of the buildings covered in this survey are certified. More than 70% of those certified buildings follow the international LEED building certification scheme, followed by governmental and industry-specific certificates. LEED and other building certificates score almost 50% higher on the Honeywell Smart Building Score.

In the case of Kuwait and Saudi Arabia, it is worth noting that certified buildings significantly outperform noncertified buildings, compared to Qatar and UAE where the difference is less profound. This can potentially be attributed to the presence of country-specific building certification schemes.

Honeywell Smart Building Score impact of certification



City Level Analysis

Score By City

Across the seven cities surveyed, Doha and Dubai ranked highest. This is most probably the result of the well-developed building codes found in both cities – the building codes being comprehensive in their coverage and universal in their enforcement.

We did not cover government buildings as part of this survey. Therefore, in cities where there are a large number of government buildings and there are building codes in place specifically covering government and/or new buildings only, this could result in lower than actual scores. This is the case for Abu Dhabi, where minimum green building requirements for government-funded buildings are higher than for others. The scores achieved by Dammam/Dhahran, Jeddah, Kuwait City and Riyadh can be partially attributed to underdeveloped building regulations. Indeed, the gap witnessed between certified and non-certified buildings explains much about the current building codes of each city. A small gap suggests that building codes are up to par with voluntary ones such as LEED, while a large gap demonstrates the opposite.

Nevertheless, the high scores achieved by buildings in cities such as Kuwait, Riyadh and Abu Dhabi that pursued voluntary certifications highlights that ultimately smart buildings can be achievable across the entire region under adequate regulatory conditions.



Honeywell Smart Building Score

Honeywell Smart Building Score by building certifications



Vertical Analysis

Analyzing the verticals across countries allowed us to identify sector-specific trends and differences across the region.

When it comes to smart buildings, safety is the #1 priority, say building managers across the region

Given higher priority in: Doha, Jeddah, Riyadh

Given higher priority in: More than 2/3 of surveyed cities

Given higher priority in: Abu Dhabi

Perception By Vertical

In the survey, the 620 building managers were asked which smart category they thought was most important to them. Across all verticals, the answer was overwhelmingly safety, particularly for airports and high-rise residential buildings. Overall, productivity ranked second. After safety, hotels, private offices, retail establishments and hospitals gave productivity the highest importance.

Across all verticals, the perceived Honeywell Smart Building Score was higher than the actual score, in some cases significantly so. High-rise residential buildings showed the biggest discrepancy, with a 16-point gap between actual and perceived scores, while hospitals showed the smallest gap.

Perception of category importance

Score By Category And By Component

There is considerable variation in overall scores between verticals, along with how the scores are distributed among the three categories. This clearly shows how priorities differ between verticals. For airports, retail and education, safety is the biggest driver. For high-rise residential and private offices it is productivity, whereas green is the highest for hospitals. While safety contributes strongly to all verticals, it is markedly lower than the perceived importance given by building managers. This suggests that the region needs further investment and deployment of security assets.

Honeywell Smart Building Score 7 verticals: score by category

Data Source: Nielsen

Honeywell Smart Building Score 7 verticals: score by component

How Connected And Integrated Are Systems In The Middle East?

Most aspects of today's buildings are controlled through one or more systems. Through integration, efficiencies can be created which generally increases the building's ease of use. With billions of people connected to the Internet today, and the number of connected devices forecast to exceed 50 billion by the year 2020¹, the Internet of Things (IoT) represents a major transformation in a digital world that has the potential to affect everyone, every business and every building.

The IoT involves the numerous devices that connect to the Internet through embedded systems and sensors, interacting with it to generate meaningful results and convenience for users. IoT will be instrumental in enabling an environment with the flexibility to provide services ranging from home automation to smart retail/logistics, and from smart environmental monitoring to smart city services. The Honeywell Smart Building Score survey has revealed that more than 50% of buildings do not have any form of system integration present. This constitutes one of the biggest opportunities to optimize building performance, with minimal changes to the individual assets themselves.

It was found that 57% of the 620 buildings surveyed have no integration across subsystems. The notable exception was airports, all of which had some level of integration. This accentuates the need for building managers to strongly monitor all airport assets and equipment in order to ensure the safety and timeliness of the airport facility.

Airports were followed by hotels, malls, hospitals, high-rise residences, private offices and lastly education. The survey highlights system integration as a significant opportunity for improvement across all verticals.

System integration across verticals

Need For Action On Smart Buildings

Government And Policymakers

- Draw from the experiences of regional best performers such as Qatar and the UAE, where comprehensive building codes have been enforced upon a large share of the total built environment leading to high rankings in the Honeywell Smart Building Score
- Consider implementing a set of internationally proven incentive schemes, both monetary and non-monetary. Together with further guidance, these could support a faster and more comprehensive implementation
- Look for ways to stimulate the exchange of expertise between GCC countries and institutions. This would lead to faster adoption of regional policy best practices as well as increased discussion of how to enforce design details such as a maximum energy consumption per square meter through tendering

Developers, Owners And Facility Management

Developers, owners and facility management may consider raising their building scores by:

- Applying the latest green, safety and productivity assets to a larger number of buildings, as well as covering a greater share of each building's total area
- Engaging and coordinating with stakeholders at the very early stage of planning and design, to enable better connected and integrated systems, and maximize asset benefits
- Increasing the uptime of available assets through shorter maintenance cycles to prevent downtime - or better programming in the case of elevator management
- Increasing the training of asset-handling personnel to ensure asset capability is translated into performance

Industry Associations, Consultants, Architects And Service Providers

This group of stakeholders may consider:

- Increasing efforts to communicate general advantages of Green, Safe and Productive buildings
- Breaking down policy requirements into transparent work packages that can be understood by less-trained personnel – e.g. breaking down tender specifications into maximum installed capacity of an AC system, instead of a general statement that implementing construction section only needs to comply with local rules and regulations
- Deploying best practices as showcase buildings
- Setting national/regional best practices and developing Sustainability Valuation Studies that show the impact of a wide scale adoption of these best practices for the local/regional economy

Vertical Insights

	Airports	
Hotels		Hospitals
	Private Offices	
Education		Retail

High-Rise Residential

Airports

Domestic and international passenger terminal buildings

Airports score the highest across all verticals, leading in all categories – Green, Safe and Productive. The score is significantly boosted by safety, particularly the asset 'screening'. This highlights the well-known need for screening of people and materials at airports for security purposes.

The top ranking airport achieved a score of 98/100 on security. How did it differentiate itself?

Assets - The top performing airport invested in assets that enabled better security, sensors and surveillance, such as:

- Electric fences
 - Sophisticated intruder sensors (glass break; dual technology motion; seismic technology)
 - Automated fire suppression systems

Connectivity - The top performing airport improved response times by better integrating the assets with communication channels. Examples include:

- Intrusion systems with multiple paths of communication (Internet, POTS, SMS, email)
- Automatically transmitted video footage on alarm events
- Cameras with off-site cloud video storage
- Remote access to digital video systems

Top Performing Assets

GREEN	SAFE	PRODUCTIVE
Efficient appliances and	Screening	• People, vehicle and cargo
fixtures	• Disaster response	movement
Flexible cooling and	systems	Remote access/wired
heating systems	• Fire detection systems	infrastructure
		Communication, data &

Communication, data & remote access

Honeywell Smart Building Score: Category

Data Source: Nielsen

Honeywell Smart Building Score: Component

Data Source: Nielsen

How Can Airports Become Smarter?

GREEN	 Develop a carbon foot-printing tool to monitor performance and enable CO₂ emissions reductions Encourage airlines (particularly national carriers) to provide carbon offsetting services to passengers Use the power of IoT and analytics to drive energy efficiency
SAFE	 Install fully integrated security management systems Implement a federated view of multiple airports in a single operations center Train and manage people to utilize systems; adhere to SOPs and recognize cyber threats such as potential internal and external attackers
PRODUCTIVE	 Increase the availability and strength of Wi-Fi access, particularly in airport waiting areas Install and/or improve the coverage of emergency power system (for elevator operation in emergencies, productivity and guest comfort)

Hotels

Luxury, mid-segment and budget hotels

Hotels rank 2nd overall after airports, which coupled with the small discrepancy between perceived and actual score, suggests a strong awareness of what 'smart' is within the hotel sector.

Given the business benefits of smart buildings, hotels are the most driven by market trends and are often leaders in building performance.

The top ranking hotel achieved a score of 88/100 on productivity. How did it differentiate itself?

Assets - The top performing hotel invested in assets that enabled better connectivity and mobility through:

- Ubiquitous , fast and secure Wi-Fi (only 13% of surveyed hotels did not have Wi-Fi access)
- Passenger and cargo elevators with convenient access, little to no service downtime and authorized access systems

Top Performing Assets

GREEN	SAFE	PRODUCTIVE
Efficient appliances and	Response systems for	Communication &
fixtures	disasters	data infrastructure
Flexible cooling and	• Fire detection systems	remote access/wired
heating systems		infrastructure

heating systems

Honeywell Smart Building Score: Category

Data Source: Nielsen

Honeywell Smart Building Score: Component

Data Source: Nielsen

How Can Hotels Become Smarter?

GREEN	 Install and/or improve the coverage and uptime of power consumption monitoring and control systems to increase transparency, enable energy efficiency savings, improve brand image Develop a carbon foot-printing tool to monitor performance and enable CO₂ emissions reductions
SAFE	 Install and increase coverage of gas and water systems to increase overall security (e.g. gas detection in car parks and rooms; LPG in kitchens; chlorine detection in pools) Hire competent personnel for safety and security; mandate the presence of safety gear & equipment institute well documented standard operating procedures for health and safety
PRODUCTIVE	 Install and/or improve the coverage of emergency power systems (for elevator operation in emergencies, productivity and guest comfort) Install authorized access systems for elevators to reduce risk Install and/or improve the coverage and uptime of elevators to increase accessibility

Hospitals

Primary/secondary care hospitals, and other healthcare facilities

Hospitals rank 3rd amongst the verticals, owed largely to the strong need to have adequate coverage and uptime.

The hospital with the highest integration across sub-systems achieved a score of 97/100. Why is integration across sub-systems so important for hospitals?

- It ensures service continuity, as the detection and monitoring of core assets and services can be done centrally and issues of concern can be prevented or addressed in a timely fashion
- It ensures resilience during emergency situations, as sub-systems can communicate through multi-channels, creating system redundancy and reducing response times

Top Performing Assets

GREEN	SAFE	PRODUCTIVE
Efficient appliances and fixtures Flexible cooling and heating systems	Response systems for disastersFire detection systems	 Communication & data infrastructure; remote access/wired

infrastructure

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Honeywell Smart Building Score: Category

Data Source: Nielsen

Honeywell Smart Building Score: Component

Data Source: Nielsen

How Can Hospitals Become Smarter?

GREEN	 Install and/or improve the coverage and uptime of power consumption monitoring and control systems to increase transparency and enable energy efficiency savings Develop a carbon foot-printing tool to monitor performance and enable CO₂ emissions reductions
SAFE	 Focus on the installation and increased coverage of the gas and water systems to increase overall security (e.g. LPG detection in kitchens) Appoint dedicated safety and security personnel; mandate the presence of safety gear and equipment; institute well- documented standard operating procedures for health and safety
PRODUCTIVE	 Increase the availability and strength of Wi-Fi access and reduce dead zones for both Wi-Fi and mobile signals (where appropriate) Install authorized access systems for elevators to reduce risk Install and/or improve the coverage and uptime of elevators to increase accessibility

Retail

Malls and shopping complexes

Along with private offices and hotels, the retail vertical is most driven by productivity in its score, highlighting the link between productivity and commercial activity.

The top ranking retailer achieved a score of 97/100 on productivity and 100/100 on security. How did it differentiate itself?

Productivity Assets - The top performing retailer invested in assets that enabled better productivity including:

- Ubiquitous, fast and secure Wi-Fi (38% of surveyed retail buildings did not have Wi-Fi access)
- Emergency Power System (EPS) (44% of surveyed retail buildings did not have an EPS)

Security Assets - The top performing retailer outperformed all other retailers in all security aspects, most markedly in:

- Screening (baggage scan, automatic full-body scanner, manual metal detector)
 - Building entry tracking system and access cards
 - Video surveillance system with multipath communication
 - Fire detection and suppression systems
 - Disaster response and evacuation systems
 - Presence of health and safety assets within building
 - Surveillance System

Top Performing Assets

GREEN	SAFE	PRODUCTIVE
 Efficient appliances and 	Response systems for	Communication and
fixtures	disasters	data infrastructure;
 Flexible cooling and 	• Fire detection systems	remote access/wired
heating systems		infrastructure

Honeywell Smart Building Score: Category

Data Source: Nielsen

Honeywell Smart Building Score: Component

Data Source: Nielsen

How Can Retail Buildings Become Smarter?

GREEN	 Install and/or improve the coverage and uptime of power consumption monitoring and control systems to increase transparency, enable energy efficiency savings, improve brand image Develop a carbon foot-printing tool to monitor performance and enable CO₂ emissions reductions
SAFE	 Install and increase coverage of gas and water systems to increase overall security (i.e. gas detection in car parks & stores and LPG in restaurant kitchens) Hire competent personnel for safety & security; mandate the presence of safety gear & equipment; institute well-documented standard operating procedures for health and safety
PRODUCTIVE	 Install and/or improve the coverage and uptime of elevators to increase productivity and accessibility Install and/or improve the coverage of emergency power system (for elevator operation in emergencies, and visitor comfort)

Private Offices

High- and mid-segment office spaces

The private offices score is boosted significantly by asset uptime followed by coverage, demonstrating a key opportunity for improvement through asset capability upgrades, such as in lighting and associated power consumption monitoring as well as disaster response systems.

The private office with the highest asset uptime achieved an overall score of 93/100. How did it differentiate itself?

Productivity Assets - The top performing private office ensured that its assets were wellmaintained and regularly running with very minimal downtime, the best amongst peers including:

- Very little to no downtime of natural resource systems (i.e. renewable energy installations, solar water heaters, grey water management, solid waste management etc.)
- Very little to no downtime of power and water consumption monitoring and control systems
- Very little to no downtime of water and gas leakage detection system

Top Performing Assets

GREEN	SAFE	PRODUCTIVE
 Efficient appliances and fixtures 	Response systems for disasters	Communication & data infrastructure
 Flexible cooling and heating systems 	Fire detection systems	remote access/wired infrastructure

Honeywell Smart Building Score: Category

Data Source: Nielsen

Honeywell Smart Building Score: Component

Data Source: Nielsen

How Can Private Offices Become Smarter?

GREEN	 Install and/or improve the coverage and uptime of power consumption monitoring and control systems to increase transparency and enable energy efficiency savings Develop a carbon foot-printing tool to monitor performance and enable CO₂ emissions reductions
SAFE	 Install and increase coverage of gas and water systems to increase overall security (i.e. carbon monoxide detection in productivity car parks) Ensure each floor has a dedicated safety champion; mandate the presence of safety gear and equipment
PRODUCTIVE	 Install and/or improve the coverage of emergency power system (for elevator operation in emergencies, and occupant comfort) Install authorized access systems for elevators in shared office buildings to reduce of safety gear and equipment; institute risk and increase productivity

High-Rise Residential

High-rise apartment units in both private and public sector housing complexes

Similar to private offices, high-rise residential building scores are also greatly boosted by asset uptime and coverage, with key asset capability opportunities in appliances and fixtures, and disaster responses.

The top ranking high rise residential building achieved a score of 82/100 on productivity and 100/100 on security. How did it differentiate itself?

Security Assets - The top building invested in assets that enabled more secure buildings through:

- Disaster response and evacuation systems
- Fire detection and suppression systems (33% of surveyed buildings had no fire suppression system)
- Presence of health and safety assets within building (only 39% of high-rise residential buildings had safety gear available with security and support staff)
- Building entry tracking system and access cards
- Video surveillance system with multipath communication

Productivity Assets - The top performing building invested in assets that enabled better productivity including:

- Passenger and cargo elevators with convenient access, little to no service downtime and authorized access system (only 16% of high rise residential buildings have dedicated cargo/service elevators)
- Ubiquitous, fast and secure Wi-Fi (38% of surveyed high rise residential buildings did not have Wi-Fi access in public areas)

Top Performing Assets

GREEN	SAFE	PRODUCTIVE
 Efficient appliances and 	Response systems for	Communication &
fixtures	disasters	data infrastructure
 Flexible cooling and 	Fire detection systems	remote access/wired
heating systems		infrastructure

Honeywell Smart Building Score: Category

Data Source: Nielsen

Honeywell Smart Building Score: Component

Data Source: Nielsen

How Can High Rise Residential Building Become Smarter?

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Education

Public and private primary/secondary education buildings and universities

While the education vertical scores the lowest compared to the other verticals, it also demonstrates the greatest promise. Education buildings in the region that have some kind of building certification score **74% higher** than non-certified buildings.

The educational facility with the highest number of assets achieved an overall score of 92/100. How did it differentiate itself?

Overall Assets - The top performing educational facility ensured that it invested in assets across all the three areas of Green, Productivity and Safety. The assets that score highest relative to peers include:

- Presence of health and safety assets within building (only 24% of educational buildings have connectivity with local civil defense teams for 'first responder' assistance and only 19% internal response team capable of handling emergencies)
- Passenger and cargo elevators with convenient access, little to no service downtime (only 48% of educational buildings have elevators)

Top Performing Assets

GREEN	SAFE	PRODUCTIVE
Efficient appliances and	Response systems for	Communication &
fixtures	disasters	data infrastructure
Flexible cooling and	• Fire detection systems	remote access/wired
heating systems		infrastructure

Honeywell Smart Building Score: Category

Data Source: Nielsen

Honeywell Smart Building Score: Component

Data Source: Nielsen

How Can Education Buildings Become Smarter?

	 Install and/or improve the coverage and uptime of power consumption monitoring and control systems to increase transparency and enable energy efficiency savings
GREEN	 Develop a carbon foot-printing tool to monitor performance and enable CO₂ emissions reductions
	• Install and increase coverage of gas and water systems to increase overall security (i.e. LPG detection in kitchens)
SAFE	• Appoint dedicated safety and security personnel; mandate the presence of safety gear and equipment; institute well documented standard operating procedures for health and safety
	 Focus on installing and/or improving the coverage and uptime of elevators within schools to increase accessibility
PRODUCTIVE	 Focus on installing and/or improving the coverage of an emergency power system (for protection from heat and dust in schools)

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