

Building Automation Systems

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The Introduction

Technology has revolutionized the way we handle problem solving in all types of situations. From the way we monitor environmental responsibility to handling the growing population of elderly and how we care for them. The building of automation systems allows us to tackle common problems in business and in society. Many years ago manufacturing plants started implementing automation systems in their facilities to help monitor air quality, air condition, electricity, water consumption and other important environmental metrics that was important to the sustainability of the environment and saved them a tremendous amount of fiscal resources. As technology has increased and has gotten more inexpensive, automation systems have found it's way it individual homes. Homeowners can control practically anything from their mobile device including but not limited to lights, air condition unit, and security systems. These are all instances of home automation systems. However, because of the growing population of the elderly, extended home automation is becoming more popular among the elderly.

Introduction to Florida's Demographics

According to an AARP article, an 80-year old Grand Junction resident said "You'll want to show them something on the computer, and they look at it for a few minutes and walk out of the room. I might have been guilty of the same thing before we got one." (AARP) The old notion that the elderly are scared of computers is starting to become history. In fact, over 53% of individuals over the age of 65, use the Internet regularly. In addition, over 14% are already using a smartphone device. (Census 1)

Another positive trend among the elderly is the increasingly amount of individuals using tablets like the ipad. According to myageingparent.com, over 40 million ipads were shipped in the first 6 months of 2013. (Myageingparent.com) This is a very positive opportunity for companies building home automation systems. In the Stephen Siller Foundation video we watched as part of Module 1, we were able to identify some key characteristics when it comes to building home automation systems for elderly. Things like top-level shelves having the ability to come down automatically with the use of an ipad. Other items being controlled by automation are air condition units, appliances, and lights.

As we discussed home automation systems among elderly, the state of Florida seems to be the obvious target for this discussion. Florida has the highest number of elderly compared to any state in the country and therefore has an obvious need for home automation systems for the elderly. According to the 2012 census, there were nearly 19 million people over the age of 65 or 17.5%. This translates to approximately 3.3 million individuals over the age of 65. (Census 2) In Florida, the counties with the highest population of elderly are Sumter, Charlotte, Citrus, Sarasota, and Highlands. While these statistics are not surprising to most Florida residents, the more surprising statistic is the amount of nursing homes located in these counties. For example, Sumter County has only two nursing homes compared to Sarasota's twenty-nine nursing homes.

(carepathways.com) Why the increase in nursing homes in Sarasota County? I asked a group of medical professionals this very question and they said the quality of living among some of these five-star rating nursing homes is a lot like resort living. Elderly individuals in need of assisted care are choosing to move to a nursing home opposed to

staying with family. Unlike the other counties, Sarasota is known for resort-style nursing homes that make it “cool” to live among friends of the same age. However, the funding for these nursing homes are becoming more and more expensive, and with the uneasiness of the healthcare system in this country, elderly may not be able to afford nursing homes. Especially the resort-style ones that can cost as much as \$400/day. This epidemic will cause us to look at opportunities to keep the elderly in their homes longer through the use of automation systems. In addition, we are seeing more facilities that allow the elderly to hang out during the day either on their own terms or through secure supervision with forms of dementia like Alzheimer’s. An example of this type of facility can be found in Sarasota called “The Friendship Center.”

Introduction of Building Automations - Smart Buildings

Smart buildings are essential to the sustainability of many different industries. IBM says, “Smarter buildings are well managed, integrated physical and digital infrastructures that provide optimal occupancy services in a reliable, cost effective, and sustainable manner. Smarter buildings help their owners, operators, and facility managers improve asset reliability and performance that in turn reduces energy use, optimizes how space is used and minimizes the environmental impact on their buildings.” (IBM) We discussed smart buildings in reference to homes and how the elderly can utilize such sophisticated system and now we examine how smart buildings are utilized from a commercial standpoint in regards to facilities. I briefly mentioned how the building of automation systems started with the ability to monitor facilities both for environmental sustainability and cost. Automation Systems in facilities can monitor many types of

equipment or processes. The most general controlled items being monitored are typically chillers, boilers, air handling units, rooftop units, and fan coil units. Other systems being monitored can include fire alarm systems, elevators, keypad/card systems, security video system, and water consumption. There are three type of automation systems that facilities tend to use, a proprietary system build internally by the company and it's employees, a system that's purchased and customized to fit the needs of that particular organization or facility, and lastly, purchasing an out-of-box web-based system that's more of an a la carte style system. The reason why the out-of-box systems are becoming increasingly popular is its cost and ability to plug and play features on the go. Also, having web-based systems give facility managers the ability to monitor facilities anywhere in the world through their computer, tablet and/or mobile device.

Intelligent Buildings

Smart buildings and intelligent buildings are very similar. In fact, most people would consider it the same thing. We spent a good amount of time discussing smart buildings and exactly what automation systems in these smart buildings are being used for. Intelligent buildings are essentially the same thing however I want to discuss the different types of intelligent buildings explored in our textbook. There is no common definition of an intelligent building because there are different uses for intelligent buildings. The three examples we will look at is performance-based, services-based, and system-based. Performance-based intelligent buildings are focused on the performance of the building and the demands of the users rather than the technologies or systems provided. Serviced-based intelligent buildings focus on the services the system provides

like receiving and transmitting information. It also has the ability to be flexible and financially economical to the changing sociological environment, diverse and complex working demands and active business strategy. Lastly, system-based intelligent systems focus completely on the technologies being used to implement the system. This can include the automation and communication network systems, and how it integrates into other systems. (Intelligent Buildings and Building Automation)

Recommendations for Phase 1 Implementation

Building automatic systems is no easy task and takes weeks, if not months of discovery and planning. When developing the phase one implementation of your new automatic system, you need to develop your needs. For example, if you are needing an automation system for a small facility and don't have a lot of fiscal resources to dedicate to this new process, than perhaps purchasing a web-based system that's already built out and can plug into your processes would be a best solution for you. It's essential to understand what needs to be monitored in your facility because many web-based systems already have plug-and-play options for you to utilize. However, if you discover something that needs to be monitor that's unique to your organization than a web-based solution might not be best practice for you. The next steps once you determine your budget and requirements, decide whether there is a web-base solution that best fits your needs or not, it's to determine whether you need something that can be purchased and modified to fit your needs or completely build it from scratch internally. Note, that building automation systems from scratch is a daunting task and takes months of time and resources. However, it gives you the best opportunity to customize something specialized

for your organization. One increasingly popular structure for building automation systems is the use of open-source development opportunities. The great benefits to using something open source is your ability to build something custom to your organization while still maintaining best practices for framework. This is also important when there is a security breach or you are in need of a new feature, typically open-source options have a lot of documentation and contributors that's already research the issue or needed item and can help you get to where you need to go a lot faster than if you were trying to build out a new feature or fix an issue on your own. Once you have determined the feature set, how you want to build your automation system out, than its time to start diving into architecture. Our textbook references the use of intelligent design, the best use of technology, and the use and maintenance of buildings. The best use of technology was already discussed when we examine the possibilities of using a technology source code like an open source solution.

The building of automation systems and intelligent buildings and homes are essential to the sustainability of our world. Our population is continuing to increase and therefore the needs of responsible environmental concerns can be handled by many of the automation systems we discussed. Environmental corporate responsibility is on the top of many executives' radars for multiple reasons. Whether they are monitoring the environmental effects for their own personal agendas, don't want to get fined by the organizations that monitor company environmental responsibilities, or how it affects their bottom-line cost like water consumption and electricity. We discussed the benefits to the elderly having home automation options that allows them to control their home from an ipad whether it's because of your age or a disability. These home options allow for

elderly individuals to stay independent and at home much longer without needing to put them in nursing homes. Understanding intelligent buildings and the different variances of how it affects your needs as a facility manager is very important. Looking at the available solutions and selecting the right type of automation system for your needs is very important.

HVACR

We take advantage of the luxuries that exist in our lives everyday. In the great state of Florida, the first time you realize how lucky you are to have a working air condition is in the middle of the summer when your air condition breaks. These luxuries are often overlooked with little notice or consideration on the complexities of how they work. How does the air condition unit blow cold air? How does it work when we flip it to warm air? How does being energy efficient play a role into the air condition unit and how it's maintain work? These are all questions we rarely ask when thinking about the cold air blowing in our living room. HVAC is the acronym that defines the system that managers heating and air-condition units. The acronym stands for heat, ventilating, and air condition. The purpose of an HVAC system is to provide interior thermal conditions that a majority of occupants will find acceptable. (Grondzik) As we explore the different characteristics of HVAC systems and the components that make HVAC systems successful, hopefully it will provide you with a greater understanding and appreciation for one of the many luxuries we take advantage of.

Role of the HVAC System

As I mentioned before, HVAC systems have a purpose of providing interior thermal conditions that a majority of occupants will find acceptable. In other words, it adds or removes heat to a room to make the majority of individuals comfortable. In addition, to adding and removing heat, it also needs to remove moisture from the building. (Grondzik) Over years, HVAC systems has gotten more sophisticated by adding controls for dedicating smoke and fires, as well as controlling air circulation and air quality. HVAC systems have the ability to condition a single or a portion space known as a local system. Larger HVAC systems have the ability to condition several spaces from a single base location. These systems are known is central systems. (Grondzik) Depending on the building the HVAC has to manage, that will determine the components required to make the system work. For example, HVAC systems that only manager single or small spaces will have different components than a HVAC system that has to manage multiple buildings.

HVACR Characteristics and Procedures

Understanding heat transfer is an important aspect to understanding the characteristics of HVAC systems. Geothermal air conditioning systems use mainly the first two types of heat transfer: convective and conductive. (Egg 24) The roles of convective and conductive are different. Convective focuses on the duct systems while conductive focuses on giving up or taking in heat for the air stream. When you're installing a new air condition system, the pipe used to distribute heat needs to be buried into the ground at six feet to normalize. Depending on whether it's summer or winter, the

ground underground core temperature can change the way heat is added and removed in the air condition unit. The temperature can completely normalize at about twenty-six feet, however, as it goes up the temperature could be off by as much as ten degrees. However, at six feet, the temperatures are very close to accurate making it the perfect depth for air condition pipes. (Egg) What happens to the heat when you turn on the air condition for the first time you turn on the system in the summer? The heat goes into the ground and stays there until you turn the heat on for the first time in the winter. This is called thermal storage or thermal retention. (Egg) Air-conditioning systems have a few basic components including earth-coupled portion or collector, load portion that's used to cool and heat, and lastly mechanical refrigeration which is used to manage the remaining energy needs for heating and cooling. (Egg) The earth-coupled portion focuses on the collection underground that helps moderate temperature. Refer to the earlier discussion about how the pipes go into the ground at six feet to help moderate the temperature. It also collects the removal of heat during the summer that will be used during the winter. The second component, which is the load portion, is any building or area that you want to distribute heat or air to. The last portion of the basic components is mechanical refrigeration which has its own characteristics that include compressor, evaporator, expansion valve and condenser. (Egg) Mechanical refrigeration is added support to supply air control through the unit. In addition to the components needed to make an air condition system work, there are also components of the air condition unit that's important for you to understand. There are a few different options when looking at different heating and cooling equipment. The first is the indoor unit which is referred to as an air handling unit which connects to ductwork to manage the air and send it to the correct

rooms. The next system is called a split system, which has a unit sitting outside that blows out the heat from the house. This unit has become more popular over the last few decades. Lastly, the package systems are often located on rooftops. These units are essentially in all-in-one system and are becoming more and more favorable. (Egg) One of the final procedures that need to be discussed is the issue on equipment sizing. Deciding on an air-condition unit is hard enough but making sure you get the right size is even more work. The common question is “How many tons of air do I need for my home?” This calculation can be very difficult and normally needs a trained professional to come out. An example of accurately estimating the size of an air condition unit needing would be a 5-ton unit that would be sufficient for a 2700-square-foot house. (Egg)

HVACR and Energy Management

Cooling and heating your house is a big piece of your electrical bill and therefore it's not only important to be cautious about the energy you're using for environmental purposes but also for the money it can save you to think energy efficiency. Ask any business owner what the largest component of their electric bill is and nine times out of ten they will say it's their heating and cooling needs. That's what facility managers need to have a good energy management plan that helps in their energy efficiency efforts. A US industry survey in 2005 estimated below 5% of existing buildings and as much as 38% of new construction had been commissioned. This represented a potential savings of \$3-\$17 Billion a year since the last survey that was done in 2000. (Mills) The important of monitoring air-condition units and/or the many components that help them monitoring other areas of need. Automation systems can monitor whether there is an energy issue

with your air condition unit. Other aspects of systems that can be monitored are air quality and heating systems. Facility managers can monitor whether there is an issue with their HVAC systems and make sure they are doing what they can to keep energy cost down and energy efficiency up. The United States created the commission to monitor and give best practices on design, construction, and operation that integrates and enhances traditionally separate functions. (Mills) There are two aspects to making sure that you select an HVAC unit that's energy efficient. First, you need to understand how to monitor and manage your unit and two, you need to understand what physical components will help you keep energy down. When thinking about the physical items, one thing to consider when selecting a system that's energy efficient is never selecting a system that's too large. (Energy Star) Other things to consider is to consider evaporative coolers, purchasing particular energy recovery ventilation systems, and installing programmable thermostats. (Energy Star) Energy management doesn't just include the automation systems needed to monitor the different aspects of air handling in your facilities. Energy management is everything that encompasses the air condition project. Yes, this may include the automation system but in addition it also includes code compliance, making sure you're doing the right thing for the environment, performance contracts, and documentation. (McIver)

As I mentioned in the beginning, we take advantage of the luxuries that we live with everyday like air and heating units. By getting a better understanding on how these units work, professionally, you can help manage and monitor these facilities why personally, it will help you select the right unit for your home. One of the biggest aspects of making sure you select the right solution for your home or commercial facility, is

making sure you're doing something right with the environment. Energy management is essential is important in the development of your air handling unit. As part of your energy management plan, selecting the appropriate automation system is important for your facility manager to make sure energy is not being wasted. To summarize HVAC systems and their effect on facility managers managing energy efficiency, understand the available units and how they work. Consult with experts to make sure you are not selecting a unit too large for your facility. Look at the opportunities to add components that could help reduce energy. Prepare an energy management plan that includes documentation and the use of the automation system you plan on using. By following these items, you will be able to build the right HVAC system for your facility needs.

Energy Management and Software Applications in Building Automation

Energy Management: Cost-oriented, affordable and energy-saving automation

Over the years, energy management has become an increasing concern among both commercial facility managers and residential owners. As a society, we've become more "green aware" and are taking steps to reduce energy whether it's in our own households or the businesses we work for. For example, we're more cautious on the items we purchase including major appliances like refrigerators and dishwashers. Or even purchasing hybrid or electric only vehicles to save on gas and be more environmental friendly. Just like we are more cautious at home on the purchases we make to save energy and be more environmental friendly, businesses are doing the same. Businesses are even going as far as getting green certifications from organizations like Green Business Bureau

and the US Small Business Administration. As automation systems have gotten more intelligent, businesses have hired facility managers that have been able to monitor and maintain energy driven initiatives. For example, there was a time (and still is) when businesses would solely review their utilities bill to determine opportunities to save money. Today, many businesses monitor facilities through sophisticated automation systems that can check quality control, can automatically adjust temperature controls, monitor for water leaks, determine the efficiency of HVAC, and automatically turn on and off electricity throughout a facility. Businesses and facility members have focused on gathering research of their energy efficiency to determine if there is opportunity to increase efficiency or learn from best practices. In fact, according to the article “Literature Review of Technologies and Energy,” countries like Korea have increased the amount of case studies on building energy reduction. Based on the information provided, from the 1980’s to the 2000’s, these cases have increased by as much as 1300%. (Lee) Many energy management solutions provide these very reports and/or case studies for facility managers to review and see year over year efficiency comparisons.

Energy Feedback Matters

As previously mentioned, countries like Korea have increased the amount of studies done on energy efficiency from the 1980’s to 2000’s. According to “Literature Review of Technologies and Energy,” the earliest reporting of energy reduction strategy and reporting was found in the mid-1970s. (Lee) In the study previously mentioned, the majority of the reports focused heavily on things like air-condition systems, building automation systems, and refrigeration while the end user policy factors focused more on

concepts and possible practices. While in Korea the reduction of energy with user policies was rare, in the United States, we've grasped the effectiveness of energy reduction for many years. There are two types of feedback a company can compile for their studies; Direct and Indirect feedback. Direct feedback relates to the displaying of the energy-monitoring device where everyone can see it. This can include but not limited to the electricity being used throughout a facility, air condition consumption and more. Indirect feedback relates to the delivery of energy bills directly to the end user. In a 1979 study, it reported that delivering energy bills to end-users 6 days a week decreased energy by up to 18%. (Lee) Consider this from a personal point of view. If your energy company sent you a bill everyday and it compared your energy levels from the year previously, how would it effect the energy decisions you were making in your household? Just like automation systems are doing, technologies have provided homeowners with the same abilities. Many companies can install energy monitor solutions in their house that can be monitored from an app or computer that allows you to see energy efficiency from week to week. As individuals whether in businesses or personally get more intelligent to the monitoring of energy efficiency in buildings, it's important that the simplicity of the application that helps them monitor is easy to use. According to the literature review, average energy savings is roughly 10%-15% through direct and indirect feedback measures however it takes a good user interface for the end-user to stay engage and willing to continue their efforts towards energy efficiency. Some companies have already developed pieces of home automation that allows this kind of control with great energy efficiency. In fact, my company, boostDFM, built a user-interface for an automation

system that monitors temperature control and air quality control for a large mobile home. The user interfaces allowed it to be successful.

Ventilated Roofs and Energy Savings

Roof design has played a very important role in energy savings. Over the years, designs and engineers have developed best practices of ventilation to enhance energy savings for facilities and buildings, including your own home. According to the US Department of Energy' "Roof and Attic Design Guidelines for Hot Climates," "roof and attic heating and cooling loads comprise a significant portion of total building heating and cooling loads, which are the largest end uses in the building sector and consume about 1 Quad of primary each year." (US Department of Energy) Essentially, proper ventilated roofs can have an energy savings of over 30%. As part of the study by the US Department of Energy, ORNL or the Oak Ridge National Laboratory that's managed by the Department of Energy, ORNL found three new designs that will help with energy efficiency including insulated and ventilated shingle roofs. According to the US Department of Energy "The new design for this ventilated roof includes a shingle roof assembly that has foil-faced EPS insulation that fits over the rafters. Its design uses convention, radiation shields, and insulation to retard the flow of heat into the attic. It uses a unique soffit opening to pull the coolest air from the soffit and attic into an included air space, which further enhances its ability to decrease heat transfer crossing into the attic. A ridge vent expels the hot air from the space back to the outdoors. The ventilation design keeps the air intake internal to the attic, which eliminates any threat of burning embers entering the included air space, which makes this system adaptable to

regions susceptible to wire fires. According to the study, this process can reduce energy cost by as much as \$120 (Miami) or \$260 (Atlanta).

Software Applications in Building Automation Systems: Recommendations

The building of automation systems has been going on for years and for many years there wasn't an absolute standardize way of building and monitoring facilities energy efficiency. Many companies opted to build these facilities on their own which was very expensive, time consuming, and required a lot of maintenance. With companies, this is an ongoing debate among IT professionals, facility managers and businesses owners on whether to develop in-house, outsource or use an out-of-box web-based solution.

Building automation systems (BAC) are “controlled, centralized, interlinked, networks of hardware and software which monitor and control the environment in commercial, industrial, and institutional facilities.” (Understanding Building Automation and Control Systems) These systems can control many different items that effect energy efficiency in a building including chillers, heat pump units, fan coil units, roof-top unites, air handling units, boilers, power monitoring, security, close circuit video, card and keypad access, fire alarm systems, elevators, and plumbing. (Understanding Building Automation and Control Systems) Pneumatic control systems are an example of a system that's still found in many buildings because of the amount of them that were built and installed during the 1960s and 1970s. Analog systems were faster and became more popular in the 1980s. In the 1990s, true automation systems were discovered thanks to digital control or DDC devices. These were fully functional systems that allow the full monitoring of different elements of a facility that can provide energy efficiency. Today, BAS systems have

gotten much more sophisticated thanks to the introduction of wireless technology. Not only does this allow facility managers more up-to-date information but it also gives managers real-time access to facility monitoring in case there is an issue. In fact, many web-based automation systems will provide mobile applications to access facility controls.

There is no question that building automation systems have come a long ways in the past fifty years, but it wasn't until the late 1990s and early 2000s when builders of these systems found a standardize way of building these facility monitoring systems. BACnet or Building Automatic and Control Network became a standardized data communication protocol developed by the American Society of Heating, Refrigeration, and Air-conditioning Engineers or ASHRAE for use in building automation to enable devices and systems to exchange information. (Merz) BACnet became the standard for building automation systems worldwide and acquired the international ISO 16484-5 standard in 2003. This was officially the first standard for building automation systems. Before this standard, many companies built proprietary solutions using elements from all types of manufacturers. Because of this lack of standardization, many of the different systems that needed to be monitored throughout the facility would not communicate with one another. In many cases, some of these elements had to be maintained separately opposed to being monitored in one centralized location. Thanks to BACnet, which is an open communication protocol that allows components from many different manufactures to interoperate, providing increased market transparency and competition. One very important element to BACnet that's sometimes overlooked is the fact that it's license-free. Before BACnet, many of the solutions that were being provided were proprietary

and required licensing fees. So in addition to the expensive maintenance of these facilities, they had to pay licensing fees, which affected just how much energy, was being saved when you had these other expenses. Just like with many open solutions or protocols that provide quality instructions and documentation, there needs to be a centralized location for facility managers to get up to date information on the maintenance and building of automation systems using BACnet. According to Merz's Building Automation, "In 2005, the BACnet Manufacturers Association (BMA) joined forces with the BACnet Interest Group North America to form BACnet International. This organization encourages the successful use of BAC net in building automation and control systems through interoperability testing educational programs, and promotional activities." While BACnet is most traditionally the standard for building automation systems, there are other standard protocols that are used in building automation system. The two most popular alternatives are KNX and LonWorks.

KNX is a standardized (EN 50090, ISO/IEC 14543) is an OSI-based network communications protocol for building automation systems. LonWorks, which gets its name from "local operating network" is another alternative to BACnet and is a platform built on a protocol for networking devices. Both of these solutions have their advantages and disadvantages; however, today BACnet is still the most popular and most widely accepted.

There is no doubt that energy management is not going anywhere and while building automation systems have increasingly gotten better over the years, it still has a lot of opportunity to grow. As technology continues to increase so will the enhancement and growth of building automation systems. As I consider the future of automation

systems, I think a lot about the simplicity of bringing these different systems together to be monitored. Today, the many different systems are still quite complicated and sometimes difficult to understand. So an opportunity would be to the creation of simplistic ways to implement an automation system in a facility. Other opportunities is the utilization of mobile and creating better gateways from online applications to mobile applications for the monitoring and controlling of these facilities. We've seen this technology become increasingly popular in homes at much lower cost. It's only a matter of time before this is much more widely accepted among businesses. Another important element that we discussed earlier was the design of the user interfaces. While many programmers or developers of these automation systems might not think aesthetics is that important to the overall experience of monitoring facilities, I believe it plays a very important role. Not only will the facilities be much easier to monitor by the facility managers but if the automation systems provided aesthetically pleasing reports for managers to understand, this would enhance their experience with the facilities and reduce the facility manager's time of having to develop reports and explain them to the stakeholders making the decisions on the effectiveness of these automation systems. While we have certainly grow tremendously, there is still more work to do.

Building Envelope and Security and Safety in Building Automation Systems

Through the years, superior envelope design for buildings has become more important to construction and building managers. Envelope design refers to the separation between the air-conditioned and the non-air condition environment. Essentially, the

walls, attics, insulation, weather protection and security protection make of everything discussed in envelope design. Building managers and key stakeholders are always looking at opportunities to reduce energy cost. Building a successful envelope design aids in the ability to be more energy efficient which is why construction managers and architects have added an increased focus on the success of envelope design.

Basic Components

The most common components of envelope design for buildings are doors, windows, roofs, and walls. There are other components that aid in providing more sustainable solutions between the air-conditioned and non-air conditioned environment. As mentioned earlier, envelope design is the separation between the environments and the basic components create that separation. Some of the elements being monitored by successful envelope design are heat transfer and the understanding of how it works, natural lighting and the building of indirect sunlight into a room, and climate control. Understanding heat transfer and the different opportunities of insulation in your walls can greatly decrease energy cost. Some items that assist in the successful insulation of your walls include the materials used for the walls themselves, the insulation you use in the walls, and the thermal mass used for the walls. Windows have gotten more sophisticated through the years and have greatly increased awareness for building managers to purchase quality windows. As windows have gotten stronger and thicker, it has allowed energy to stay enclosed in the building. Additionally, another characteristic of building successful envelope design is the concept of using natural lighting with indirect sunlight. Direct sunlight can raise the heat inside a building and might not be the most energy

efficient solution but indirect lighting from the sun allows for natural light that could eliminate the need for using actual lighting. This would greatly reduce energy cost if lights are only used in minimal circumstances.

Benefits of Building Envelopes in BAS

The common characteristic of successful envelope design for buildings is energy efficiency. There are two different elements to consider when developing the plan for your envelope design. Energy efficiency and how lighting and heat transfer the effects it has on your energy overhead cost and the sustainability of our building long term through successful energy efficient designs. Envelope design is essential according to the Whole Building Design Guide (WBDG), a program of the National Institute of Building Sciences. The WBDG is a complete guide to the successful building of envelope design. “Richard Rush, in his book *The Building Systems Integration Handbook*, defines a building in terms of only four systems: Structure, Envelope, Mechanical and Interior.” (WBDG) The guide continues by quoting Rush, “The envelope has to respond to natural and human values.” As mentioned earlier, not only does it provide energy efficiency but security plays a role in successful envelope design. Successful envelope design provides security to the individuals in the building as well. There are two ways to look at security. The first would be the protection from natural causes like snow, rain, storms, and other natural causes. The second would be security from intruders. For example, we discussed the sophistication levels of windows and how they have increasingly become thicker and stronger leading to more energy efficiency inside the building. However, these same windows also protect from natural security risk and intruders. Sarasota is the world leader

in high efficient windows and doors. PGT Industries builds hurricane-protected windows and doors which serves as protection from natural causes and intruders.

Security and Safety in Building Automation Systems

We've touched on security when reviewing envelope design for buildings. Security is a very common consideration when discussing building automation systems. Most automation systems take in consideration a security component that's referred to as CCTV or Closed-Circuit Television. The system is connected to multiple security cameras throughout a building facility and is viewable in some sort of centralized security system. Other elements of security can include access control systems, fire alarm system and burglar system. Security and safety are an instrumental component of building automation systems whether you are purchasing a solution out-of-box or building a system on your own, these things need to be considered.

Security and Safety Overview

There are different reasons why security is important to facility managers. The first element is the protection of physical inventory. Monitoring the security of facilities through access control systems and closed-circuit television allows you to see who's going in and coming out of buildings. Additionally, you are monitoring to make sure no intruders are trying to get access to certain areas of the building. In high-security facilities, there may be individuals/employees that have access to certain areas of a building. In this instance, automatic systems will need to be much more sophisticated to

distribute permissions among particular areas throughout a facility. Additionally, another important aspect to security is the protection of your employees. There are many industries or facilities that individuals may want to bring harm to the people that work or support the organization. This is another component of making sure you have strong security systems in working order.

We've discussed the importance of safety among your employees when dealing with security and safety. There is another component of safety that's an essential part of automation systems and that's burglar alarm and fire alarm systems. Making sure your product, systems, or inventory is protected from burglars if they were somehow able to sneak passed the CCTV system than having a burglar system that monitors intruders and makes a call to law officials if someone were to intrude on the location. Additionally, fire alarms serve a similar purpose in safety. One it protects the employees from possibly being locked in a facility with no ability to exit. Secondly, it helps protect the facility from a fire. Especially in large facilities, if the system detects a fire in one area of the facility, than the system will allow facility managers to get the fire out before it reaches other areas of the facility. These are all essential to the success of security and safety in automation systems.

Challenges to Security and Safety in BAS

One of the challenges that building automation systems (BAS) have in regards to the integration of all these security and safety components is the opportunity of one system that's controlling on your systems to be compromised. According to our textbook, "these systems were dominated by proprietary hardware and software solutions." (Wang)

However, today more facility managers are moving to out-of-box solutions to save on cost, maintenance, and time. This could allow intruders the ability to learn about these systems and eventually discover an opportunity to compromise the system. Because the systems is all available in one location, the intruder would have access of disarming the alarm systems, fire systems and have access to the CCTV and access control systems. This could be detrimental to a facility manager who's trying to protect employees and inventory. Additionally as these systems become more complex, the engineers need to develop integrate systems to monitor all the different aspects of the automation systems.

Typically when discussing automation system development, we focus on energy efficiency and the components that allow facility managers to save money and make their systems more environmentally friendly. This is evident in our discussion on envelope design, which has a dual purpose of energy efficiency and security. With envelope design we are able to save energy through the understanding of heat transfer and the development of using natural light to reduce lighting in the facility. Additionally, envelope design does provide a security component both from natural destruction and intruders. This segways into the importance of security and safety, and the development of these items for automation systems. The different components regarding security allow facility managers to monitor security through access control systems and a closed-circuit television system. Additionally, burglar and fire alarm systems allow facility managers to maintain safety for the facility and the employees inside the facility. While there are challenges that facility managers face in the development and integration of these components for building automation systems, integration is the future and therefore businesses should focus on the complexities of bringing these components together.

Conclusion: Who will Benefit

Why BAS is beneficial to the Elderly Population in Florida

Florida is full of opportunity to excel in this area. When examining the opportunity of building automation systems for the elderly population, there are many components that could greatly enhance the quality of living for elderly still wanting to maintain their residency at home. Especially in Sarasota, the rising amount of elderly continues and as leaders in the community, we need to understand how we can assist in allowing these individuals to have a great quality of living until it's their time to go. Examples of how automation systems could enhance the elderly's ability to be self-sufficient is starting with a centralized controller that's easy to use and maintain. It's no secret that many of these individuals lack the technological know-how to work complex devices. In addition, these individuals are not a fan of change so helping them understand how to utilize such a device and keeping it as simple as possible with one-button solutions that have audio controls and large icons. This centralized controlling unit will allow the individual to control lighting, television, phone, kitchen appliances and other household appliances like a washer and dryer. If the individual is in a wheelchair then the home can provide additional controls like the cabinets coming down lower for them to grab items or controlling a wheelchair lift up the stairs. All these items can greatly benefit individuals who need assistance in their home. Our current elderly population (75+) might have a harder time understanding or adapting to such technology but as the baby boomers move into the elderly stage, they have had the opportunities to adapt to technology and might be able to adapt to new systems. As we think about the future, we

should consider the ages on which these individuals are growing up and their environments surrounding them.

Highlight other populations who may benefit and how

I believe all generations and populations can benefit from some sort of automation. The average family having the ability to monitor energy levels and control appliances and throughout the house would certainly enhance their ability to save on energy cost and be more environmental friendly. Many companies have already started offering services that allow homeowners to control temperature controls and monitor CCTV's in their homes. They are saving energy and protecting their home. Additionally, I believe different sectors of individuals could certainly utilize services of automation systems. We've discussed on the elderly can utilize such services especially if they are in the wheelchair. I believe handicap and wounded veterans can also greatly benefit from the use of automation systems in the home. Being in a wheelchair and having a control unit that allows you to control lights, security, appliances and other components throughout the home. Allowing these individuals to be self-sufficient through automation gives them the confidence to do things on their own and will be a greater assist to society. With veterans, there are always discussions happening on why they have no desire to be successful in society. Giving them self-worth in their own home gives them the confidence to do much more in society. Automation enhances the quality of living for all and could help any individual become more self-sufficient.

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