

ACCESS CONTROL AND THE FUTURE OF SMART BUILDINGS

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INTRODUCTION

Smart building technology continues to be one of the most exciting and revolutionary developments in the multifamily industry as it streamlines operations and transforms resident, prospect and associate experiences.

With an ever-growing share of multifamily buildings now Internet of Things (IOT)-enabled, a smart-building strategy has become a necessity for operators. In this paper, we shall discuss the essential elements of the smart building strategy, their financial impact and the long-term objectives that should drive companies' choices of technology and vendors.

Access Control Defines Smart Buildings

The most important and foundational part of any smart building strategy or system is access control. For many operators, the systems that control access to buildings and access to individual units are provided by different suppliers. But that approach is unsatisfactory for residents and prospects who increasingly expect seamless, technology-enabled experiences. The long-term impact of COVID-19 on resident behavior and leasing processes has made access control an even higher priority.

With access control increasingly central to the attractiveness and competitiveness of multifamily properties, it makes sense to consider the components that differentiate great access control systems from the rest. This paper covers each element, including how to consider options for connectivity, security and compliance and the software that enables operators to operate the system and achieve the financial benefits.

Benefits of Smart Building Technology

With such a broad range of potential benefits, it is important to understand how each aspect of smart building technology delivers a return on investment (ROI). This paper includes a detailed example of the costs of implementing best-in-class access control

and finds that a relatively modest rent increase (\$20 per month) pays for the entire implementation within three years at a five-year IRR of almost 40%.

Having established a highly compelling business case for access control, we turn to two important further considerations. First, we examine the additional benefits (above the rent increase) that accrue from the implementation. Finally, we use an analytical approach published in a 2017 Forrester Research paper to understand the impact of customer experience upon a community's ability to achieve the revenue upside predicted in our example.

Looking to the Future

Having established the elements of great access control and understood the financial implications of implementing it, this paper concludes by looking towards the future, focusing on three critical questions.

First, we ask if the technology's design supports the evolving needs of an organization. Next, we consider the changing nature of customer experience and what it will mean for the access control systems of tomorrow. Finally, we summarize recent developments in smart home vendor space and their implications for partner longevity: a critical consideration for a technology that seems set to redefine multifamily operations for years to come.



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HOW TO THINK ABOUT ACCESS CONTROL

A little over a year ago, we reported in our 20 for '20 white paper (where we interview 20 senior executives on the outlook for multifamily operations and technology), that leaders said that the industry “lacked a complete access control solution.”

The heads of operations and technology who shared this sentiment were, for the most part, excited at the possibilities of smart home technology, which made the observation about access control all the more curious.

The Internet of Things (IoT) offers radical change to many aspects of multifamily operations: from enhanced prospect and resident experiences to operating efficiencies. The extended period of COVID-enforced work from home has raised the profile of smart home technology. Residents have been spending more time in their apartments, consuming goods and services that require delivery or apartment access. Tours and other aspects of operations have become contactless. Buildings with IoT technology have been better placed to handle the change in circumstances. But some aspects of functionality have proved more critical than others: most notably access control.

Many aspects of the smart home experience are designed for the individual home, including keyless entry, thermostats, lights and leak detectors, for example. Unsurprisingly, IoT technology vendors have worked to bring this connected home experience to multifamily housing. But most multifamily operators leveraging smart home technology from one vendor still use building access technology provided by another. The two-system approach to access creates friction, which became more noticeable as COVID changed traffic patterns in and out of buildings.

A growing subset of operators have come to regard access control as the highest priority in their smart building strategy. As we shall discuss, there are compelling reasons to follow an “access-first” strategy, and in this first chapter, we will unpack some of the pitfalls of access control and how to do it well.

2.1. THE FOUNDATION OF THE SMART BUILDING EXPERIENCE

It is impossible to talk about the state of multifamily operations without considering the impact of COVID-19. Of the many changes that the pandemic has forced upon multifamily operations, two stand out above all others: widespread work from home arrangements and self-guided tours.

Work from home simply means that residents are spending unprecedented time in their units. There are a couple of important implications for IoT technology. First, some of the benefits of managing a unit during the time that it is empty have become less important, at least temporarily. Remote control of temperature and the watchful presence of leak sensors are largely redundant for a resident who is home most of the time. At the same time, demand has increased for services that must be delivered to the apartment.

Apartment communities offering a quick and seamless way to arrange access for service providers, deliveries and guests have enjoyed a natural advantage in adapting to the changes forced by the pandemic. They have also been able to offer an elegant solution to the pressing challenge of self-show.

As the 2020 lockdown provisions came into effect, operators had to move quickly to enable prospects to tour their communities unaccompanied by a leasing agent. This rapid change caused the vast majority of operators to scramble to arrange access, print tour paths, and so on. But many op-

“Even before COVID, we recognized that our customers often want the ability to tour nights, weekends, maybe not with an associate to best serve their needs...”

erators were already working or planning to work on self-show before the pandemic.

In a recent interview, Karen Hollinger, SVP of Strategic Initiatives at AvalonBay Communities, shared that *“Even before COVID, we recognized that our customers often want the ability to tour nights, weekends, maybe not with an associate to best serve their needs. We started a technology project to allow our residents to go directly from the tour request process to being granted access to the door.”*

While most operators spent 2020 organizing “key on a stick” tours for prospects, companies who had already solved the problem of access had an easier time handling the demand for self-guided tours. They also had an intangible advantage in the experience that they could offer to prospects touring their properties. As a prospect comparing apartment buildings on a shortlist, the tour that includes frictionless access to the building, public areas and the show unit surely outperforms the one that begins with a lockbox.

2.2. THE ELEMENTS OF GREAT ACCESS CONTROL

By now, it should be obvious that to do access control well, a resident or visitor must have complete “curb-to-kitchen” access. Residents and prospects should be able to enter the building through the front door or garage where applicable and to access their unit and any other common areas with a single set of credentials and with no requirement to carry a key fob or keys.

One System, All Elements

In a typical mid-rise multifamily community, providing these elements requires a door controller with a camera, readers for common areas and door locks to be provided on a single manage-

ment system. Organizing a self-guided tour, a delivery or providing guest access all become inconvenient when multiple systems are involved.

The level of friction between systems is not the only customer experience consideration: there are numerous ways to open a smart lock. Millennial and Gen Z residents and prospects famously conduct as many aspects of their life as possible through their phones and increasingly their smart-watches. A single app mobile experience is therefore essential both for enabling contactless access and issuing temporary pin codes for service providers and guests.

Security Is Paramount

Security and privacy provisions are also important components of the resident experience. The ubiquity of digital cameras, for example, creates the opportunity to record all activity taking place in front of a lock. For a resident, being able to retrieve photographs of anybody using their lock is a high-value amenity, provided the photos are subject to a privacy policy that means that only they can access them. The recording of images of all activity involving front doors, elevator and public area sensors improves the security of a building, which is also beneficial to residents.

Another important security consideration lies in the way that a building’s IoT devices connect to the internet. It is a consideration that attracts some diversity of opinion between industry technology leaders and has important cost implications, as we shall demonstrate in the next chapter.

Organizing a self-guided tour, a delivery or providing guest access all become inconvenient when multiple systems are involved.

Most smart building technologies require ID credentials (e.g., a code) to be authenticated when somebody attempts to open a lock. In some buildings, individual locks connect directly to an authentication system via a cellular or wifi network. But this entails a security drawback: if a hacker were able to access the building network and the authentication system, they could access all locks in the building.

Some smart building architectures mitigate this risk by placing a single hub into each unit that controls all IoT devices in the apartment. The hub provides an additional layer of protection, as a hacker would have to gain access to each unit hub to open the doors in a community. But hubs are an additional cost, and while they are undoubtedly useful for coordinating the IoT devices in a unit, the locks are nevertheless still online 24/7 and hence available to be hacked.

In addition to security, cell coverage may determine which type of connectivity is the best fit. Weak or intermittent internet or cell coverage compromises customer experience and places a burden on the device's battery life. Bulk internet is one solution to this problem, although that also comes at a cost and incurs the "always online" risk described above. Bulk internet is also subject to power outages, which is a risk when a community depends on it to operate its door locks.

Locks Don't Need to Be Online

In the era of cloud computing, one appealing option is to leverage individual cellphones to connect locks to the internet. When a phone can unlock a door directly (without needing to connect to the internet for authentication), then each individual's phone can do the work of communicating access information to the cloud. This transfer can take place passively whenever the phone has cell signal, delivering both convenient access and

trackability while removing the need for the lock to be online at all if that fits the needs of the building.

For many operators, the lower-connectivity option is highly appealing. According to Craig Berberian, Founder and Managing Partner at Empire Property Group, a Los Angeles-based multifamily owner-operator: *"We looked at a lot of options as we really thought through the way that we want access to work in our buildings. We much preferred the idea of having locks that don't need to be online, both from a connectivity and also a security perspective."*

Many security-minded leaders feel that is a risk best mitigated by choosing smart locks that can be operated without being connected to the internet. Jason Knutsen, VP of IT Infrastructure at AMLI Residential shared the following view: *"Security was one of our highest-priority requirements, so we researched it extensively as we evaluated smart building technologies. Our preference is to avoid having a lock online 24/7, so we opted for a technology with a security model where a resident's credentials open the lock directly, rather than having to be authenticated."*

Compliance is Critical

In addition to the manifold aspects of security, compliance with federal, state and city-level regulations is central to identifying the right access control solution. Access control touches so many aspects of building operations that safety is paramount.

When choosing an access control solution, it must be compliant with all of the fire protection codes that apply to the building. That is easier said than done, as fire regulations can be onerous. The implementation must also comply with the extensive demands of the Americans with Disabilities Act (ADA) to avoid the high costs associated with violations. Local, state and federal regulations

vary from jurisdiction to jurisdiction, so the critical point is to understand which technologies and vendors have already offer compliance with the relevant building regulations.

Software Drives ROI

Even with all the elements described above, access control is only truly great when an operator gets to control it through a single enterprise application. From self-guided tours to move-ins to maintenance access and the myriad resident access requirements, the issuing and tracking of access controls must be a centralized function. The single control mechanism (for both building and unit access) was perhaps the most important missing ingredient for those multifamily leaders who one year ago saw no good access control solution in the industry.

As we shall share in the following chapters, there are great and comprehensive access control systems in the industry. As we have discussed, the architecture of those systems varies significantly, and operators must understand those variations and their impact on customer experience and ROI. In the next chapter, we will provide a specific example of how to estimate the ROI associated with the type of access control we have described above. We will also provide a detailed discussion of the broader pool of benefits available to companies adopting smart building technology.



LEASING OFFICE

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WHY SMART BUILDINGS ARE HIGH-PERFORMING BUILDINGS

In the previous chapter, we touched on several sources of benefits that make Smart Building technology unusually compelling to operators and investors. It is hard to think of any technology or innovation that can impact as many aspects of the multifamily experience.

It improves prospect and resident experiences, leading to increased rent and likelihood of renewal. Keyless entry improves associate experiences, saving time from many tasks that traditionally involve keys. Add leak detectors, thermostats and any other smart devices to the same system, and the efficiencies pile up.

With such a broad range of potential benefits, it is important to understand how each aspect of the smart building platform delivers ROI. In this chapter, we address the combination of tangible and intangible benefits that operators should consider when weighing up the benefits of smart building investments. As we will explain, to understand the likely return on smart building investments, operators must understand three things:

1. Those benefits that are the most readily quantifiable, the costs of achieving those benefits, and what that means for investment underwriting.
2. The additional, intangible benefits that accrue from IoT capabilities: i.e., those attributes that make a multifamily operation more efficient, above and beyond those efficiencies to be measured for underwriting purposes.
3. The impact of the *nature and quality* of the specific technology upon the likelihood of capturing the predicted financial benefits.

We will elaborate on each of the three points in the following subsections.

3.1. TANGIBLE RETURNS AND INVESTMENT UNDERWRITING

There are two types of tangible benefits: cost savings and revenue increases. This chapter will explain the main considerations for quantifying each type before providing an example of an ROI illustration that a multifamily operator could use

to underwrite a smart building investment.

Cost Savings

In multifamily, as in all service operations, efficiencies do not always result in tangible cost savings. That is not to say that efficiencies are not attractive unless they equate to a tangible saving: as we will discuss in the next subsection, the additional ROI sources make important contributions to operational efficiency. Time-saving efficiencies do not always lead to staff reductions that contribute directly to the bottom line, but they can increase the time available to focus on higher-value tasks, for example. Below we list some tangible cost-saving opportunities and the process or technology requirements that would be required to achieve them.

- **Enablement of Self-Show** is a capability that is sure to become increasingly important in multifamily operations for the foreseeable future. Where a company is able to organize apartment access as part of a self-show program, they have the potential to change their leasing model. A cluster of apartment communities, for example, could share leasing consultants due to a reduced number of associate-accompanied tours. In this case, the access control component is instrumental in delivering a tangible reduction in headcount.
- **Costs associated with creating and managing keys** can be surprisingly expensive to multifamily properties. This includes the cost of making keys, re-keying and handling lock-out situations, which can collectively run to thou-

In multifamily, as in all service operations, efficiencies do not always result in tangible cost savings.

sands of dollars a year for a typical building.

- **Reduced damage through leak detection** can result in the reduction or elimination of some substantial one-off costs. While leak damage may not appear as a line item in a typical community's P&L, communities must nevertheless account for repair costs that can run into tens of thousands of dollars and more when a leak goes undetected. With such high costs attached to fixing water damage, the avoidance of a single incident per year usually justifies the cost of implementing leak sensors by itself. There may also be a direct saving on the property's insurance based on sensor implementation.
- **Energy savings** filter through to the bottom line wherever a property can control the temperature of vacant units and common areas. In parts of the country where seasonal high and low temperatures are normal, unnecessary costs accrue when a vacant unit's thermostat is set too low or too high. By connecting a smart thermostat in every unit to the enterprise control system, an operator can stop the waste from happening and bank the savings.

Revenue Increases

Enabling buildings with smart home technology improves living experiences in numerous ways. Imagine two identical buildings in the same submarket, where one implemented an access control system that works the way we described in Chapter One, and the other did not. It is hard to imagine that the building with access control would not be strongly favored relative to the building that did not have it. The preference for the smart community is normally reflected in higher rents, all other things being equal.

Where a single amenity is likely to result in a rent increase, it becomes especially valuable to the community. It also represents a particularly attractive way of underwriting the investment, as it provides a single variable that can be priced relative to the market. Morgan Blum, the Director of Operations for Panther Residential Management, LLC, a Massachusetts-based operator of multi-family properties in the southeastern US shared: *"The market rent potential tends to drive our decision to implement smart building technology. There may be some cases where we don't think the market will bear the additional charge, but we're increasingly finding that good access control is table-stakes in most of our markets."*

Local market dynamics can give operators a basis for understanding the size of the potential revenue increase from smart building technology. They can also provide the means for companies to measure the impact of their investments. As we have written extensively elsewhere, the most effective metric for measuring the impact of amenity pricing is "days on market" (DOM).

DOM measures the time between the notice to vacate of the departing resident and the arriving resident's application date. This "time in play" provides a reliable proxy for the market response to

The most effective metric for measuring the impact of amenity pricing is "days on market" (DOM).

price. Operators can compare the average DOM of homes that have a given amenity against homes that do not have it. If the DOM increases, then the

price allocated is likely too high for the market. If it is lower, then the amenity is underpriced.

The combination of a simple, attractive ROI metric (rent increase) and a reliable way of measuring it provides a strong basis for ROI analysis. The final ingredient we require is a projection of costs, which enables us to predict the returns that we can expect to receive in exchange for our smart

building investments. In the example in the table below, we set out the costs alongside the revenue projections to understand the ROI of an example smart building investment.

As we discussed in the first chapter, access control and the enterprise system that enables it are foundational to the smart building experience. Operators can, of course, add whatever

Smart Building Investment: ROI Analysis			
	# of Units	Unit Price	Total Cost
One-Time Costs			
Apartment Door Locks	250	\$249	\$62,250
Installation - Apartment Door Locks	250	\$100	\$25,000
Door Reader	8	\$599	\$4,792
Installation - Door Readers	8	\$1,000	\$8,000
Intercom	1	\$2,999	\$2,999
Installation - Intercom	1	\$1,000	\$1,000
Total One-Off:			\$104,041
Recurring Costs			
Access Control Software	250	7	\$1,750
Average Occupancy			95%
Annual Lift @ \$20/unit Average			\$57,000
Annual Software Costs			\$21,000
Annual NOI Gain			\$36,000
Payback (years)			2.89
IRR (5 years)			39%

combination of additional devices and services they choose at each community. But since smart building capabilities are generally built on the foundation of access control, the example below is germane to all smart building investment decisions.

The example uses a typical 250-unit property with a 95% occupancy. We have used an average rent lift of \$20 per unit per month, which constitutes a modest increase compared to the \$30 from in the NMHC-Kingsley report of 2017, and all the private internal analysis that companies have shared with D2 since then. To deliver the experience that earns that rent increase, the property must add individual door locks to all 250 units and eight external door sensors and an intercom. The architecture in this example does not require a hub or internet connectivity, as the lock can verify individual codes without authentication.

We have also applied standard costs (i.e., assuming no bulk discounts) for each device in the table above, along with the installation labor costs. Labor costs vary significantly from city to city, so the costs above represent a nationwide average. With an average rent increase of \$20, the access control system pays for itself within three years, at a five-year IRR of 39%.

This business case is compelling based on the rent increase for access control alone. We have not had to ascribe dollar values to any of the additional benefits listed earlier in this subsection or the intangible benefits we will summarize next.

3.2. ADDITIONAL SOURCES OF ROI

Now that we have identified a source of ROI that justifies the cost of the implementation and a way to ensure that the property is reaping the predicted benefits, we should consider the numerous sources of benefit that we did not include in the

business case. We have summarized some of the main items below.

Time Savings From Keyless Operations

Earlier, we noted that by implementing access control, communities have the opportunity to save themselves the costs associated with creating new keys and dealing with lockout situations. But the greater impact on the smooth running of multifamily operations is the ability for property teams to manage the whole move-in and move-out process through a single system.

Josh Lloyd, Senior Vice President of Operations with Atlanta-based developer and operator, Wood Partners, pointed out how central time savings were to their choice of smart building technology. *“We look carefully at the amount of time that the community will save by not having to deal with keys for tours, move-ins and -outs, maintenance tasks and so on. We’ve estimated how much of our associates’ time we can save and re-focus on delivering more value-adding service.”*

As we mentioned in Chapter One, it is still normal for many operators to purchase building access control and unit door locks from separate companies. But the time wasted and the inconvenience of having to update multiple systems is an obvious suboptimality. The best example of the potential efficiency gains comes from student housing, where entire buildings are routinely turned over in a matter of days at the start of the academic year.

Jamie Grant, a Vice President with L3 Campus

“Access control is so central to the way that we manage move-ins and move-outs that we now consider it a necessity.”

Communities, an owner-operator of luxury student housing, shared: "Access control is so central to the way that we manage turnover that we now consider it a necessity."

Contrasting L3's access-controlled environment to operations that still use keys, Grant added: *"We enter each resident's details in one system when we process the lease, then activate when all the move-in requirements are satisfied. The whole process can now be handled remotely, which is a huge benefit during mass move-ins, especially in the age of contactless move-ins."*

Maintenance and building development are important beneficiaries of improved access control. One only has to imagine the number of steps that a maintenance tech has to take to retrieve keys to each apartment that they have to visit in a given day to understand the potential time savings.

Alvaro Leiva, VP of Asset Management with northern California-based developer, Summerhill Apartments, spoke enthusiastically of the improvements that Summerhill's access control program had brought to their developments. *"As a builder, having a single, holistic access control solution has delivered a couple of important efficiencies. Punching or turning units becomes far*

When a prospect sees an agent effortlessly passing through the building using their phone, or even their smartwatch, the lifestyle implications become clear.

more efficient when you don't have to walk around with a bunch of keys. It also enables us to lock out construction instantly as soon as a project is complete."

The Benefits Of Keyless Tours

Earlier in this chapter, we outlined how self-show has created the opportunity to change staffing models for leasing operations. Readers of D2's blogs and white papers will be familiar with our view that multifamily leasing is on an irreversible path toward an increasingly self-serve environment. But operators do not need to reconfigure their staffing model to reap rich rewards from the improvements that access control delivers to the tour experience.

First, on traditional agent-guided tours, the perception of the smart building technology improves the impression of the building. The technology that the leasing agent uses to access units and common areas becomes a central part of the tour script. When a prospect sees an agent effortlessly passing through the building using their phone, or even their smartwatch, the lifestyle implications become clear.

The impression that the technology left on the prospect was an important factor for Empire Property Group. Its founder, Craig Berberian told us: *"We saw an opportunity to add an amenity that would improve our experience, both for residents and for prospects touring our properties. The quality of that experience was decisive in choosing the technology, and we have found that the way that we handle access has become a big talking point in prospect tours."*

The lifestyle benefits are particularly obvious in the case of self-show. In Chapter One, we noted how a technology-enabled tour, managed through a phone or a simple access code, contrasts to a tour that begins with a lockbox. The direct experience of access control is a powerful differentiator for properties that use it, especially when a prospect comes back to the property multiple times, as many do.

Energy Savings And Peace Of Mind

In the previous subsection, we mentioned the financial benefits that result from controlling temperatures in vacant units and public areas. But there are further benefits that accrue beyond the direct energy savings to the property.

First, and most obviously, when a unit is equipped with a smart thermostat, the resident can usually expect lower utility bills by fine-tuning temperatures to minimize waste. The ability to control the thermostat seamlessly through the same application that the resident uses for access control is also better than having different apps for each.

The direct experience of access control is a powerful differentiator for properties that use it.

Depending on the extent of the deployment of thermostats, communities can also monitor unit temperatures on their residents' behalf. This could provide a safeguard against accidents, like leaving a window open during a period of freezing weather. A similar logic applies to leak detection: in addition to the tangible benefits noted above, the prospect or resident has greater peace of mind when technology helps them avoid damage to their home and belongings.

All of these energy and damage-related benefits have an important branding consideration. They help to create the impression of an environmentally friendly community, an increasingly important attribute for the generations currently renting apartments.

The Platform For A Best-In-Class Customer Experience

The final area of intangible benefits is one that we will elaborate on through the remainder of this paper: customer experience. We have described at length already the impact that a seamless, best-in-class access control system can have upon prospects, particularly during the tour. But as access control becomes more ubiquitous, operators should consider carefully the additional services and experiences that they can offer through the same platform.

Access control mobile apps are unusually sticky: when the phone is central to organizing building access, residents tend to use it multiple times each day. "App fatigue" has become an unwelcome feature of apartment living in an environment where many different technology or service providers ask residents to download their mobile apps.

With access control so central to the apartment living experience, operators have the opportunity to channel more day-to-day technology-enabled functions through the access control app. Organizing today's deliveries and services and tomorrow's additional experiences should be central to how operators think about the technology that enables their smart building strategies.

3.3. HOW CUSTOMER EXPERIENCE DRIVES RETURNS

The impact of customer experience is notoriously difficult to quantify, especially in multifamily housing, where so many things contribute to resident satisfaction. But in the case of smart home technology, and in particular access control, where the quality of the experiences varies significantly, it is important to understand how the experience is likely to impact the revenue

potential discussed earlier in this chapter.

In their 2017 white paper, “Drive Revenue With Great Customer Experience,” Forrester Research shared the findings of an analysis of the impact of customer experience in the industries that it serves. Its analysis model focused on the relationship between a customer experience index and revenue growth while accounting for four major variables that influence a company’s revenue potential:

- Barriers to switching
- Relationship value
- Recommendation effectiveness (i.e., the opportunity for an existing customer to recommend to another potential customer)
- Enrichment opportunities (i.e., the opportunity to drive incremental purchases)

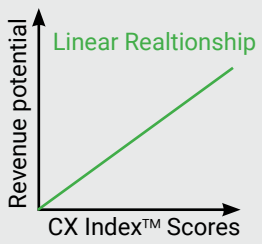
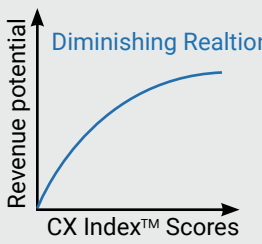

Multifamily operators or investors will be immediately familiar with the first two items. A resident’s decision to move house is heavily influenced by

external factors, and moving house is a pain. But the living experience impacts marginal decisions about whether or not to renew, and the level of renewal increase that the resident will pay. The relationship value is unusually high in multifamily, where purchase decisions typically come in the form of 12-month leases.

The impact of recommendations is marginal compared to other industries, online retail, for example, but the prominence of review sites means that it is still an important consideration for multifamily. The research, which involved 122,500 US adults, found that “advocacy potential” (where customers who have excellent experiences are likelier to recommend and to more people) gets progressively higher as customer experience scores increase.

Although in the research Forrester does not study multifamily housing specifically, the segment of companies to which it fits most closely (the one that includes upscale hotels and auto manufacturers - see diagram) is the one whose revenue

Forrester’s Model Shows 3 Types Of Relationships Between CX And Revenue

Revenue potential and CX scores move in lockstep	Increases in revenue potential get progressively similar with higher CX scores	Increases in revenue potential get progressively bigger with higher CX scores
 <p>Linear Relationship</p>	 <p>Diminishing Relationship</p>	 <p>Exponential Relationship</p>
<ul style="list-style-type: none"> • TV service providers • Internet service providers • Big-box retailers • Rental car providers • Auto and home insurance 	<ul style="list-style-type: none"> • Wireless service providers • Airlines • Credit card providers 	<ul style="list-style-type: none"> • Traditional retail banks • Direct banks • Hotels: upscale • Auto manufacturers

potential is the most positively impacted by improved customer experience.

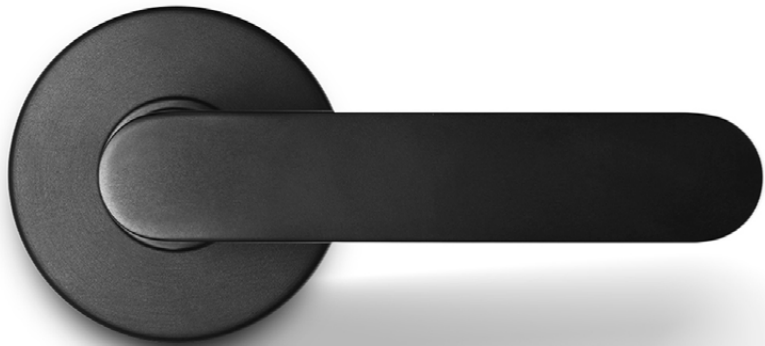
As the diagram shows, industries with low barriers to switching tend to find a linear relationship between customer experience scores and revenue potential. Industries like airlines and wireless providers see great upside in fixing bad customer experience but then hit diminishing returns on higher customer experience scores.

In the industries with the combination of high barriers to switching, high relationship value and high recommendation effectiveness, Forrester observes an exponential relationship between customer experience and revenue potential.

This finding should give multifamily operators pause as they consider their smart building strategies. The technology has a clear impact on living experiences, which impacts not only the price point at which a resident will lease or renew but also the likelihood that they will advocate for their community. Or, to put it another way, the better the experience, the greater the revenue upside.

Operators underwriting their smart building technology projects on revenue upside should focus on the experience that the technology delivers. It is one thing to underwrite based on a predicted revenue outcome, but another to secure the rent increase. With access control so central to customer experience, the design of that experience will profoundly impact financial performance, as we shall discuss in the final chapter.

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CONCLUSION

So far in this paper, we have focused on the fast-changing smart building technology environment in multifamily. We have described the ways in which experiences and customer preferences have changed, particularly in the post-COVID environment, as work from home has re-prioritized some customer needs, maybe permanently.



We have outlined the numerous differences between best-in-class access control and the versions that most multifamily operators are still settling for at the time of writing this paper. Finally, we have demonstrated how easy it is to justify the investment in smart building technology and listed many of the additional benefits currently being experienced by companies that have adopted the technology.

As we attempt to assume the multifamily executive's perspective as she defines her company's smart building strategy, three important considerations remain. When considering which platform to deploy in multifamily communities, executives should consider the nature and quality of design, the range of future smart building experiences, and the long-term viability of the potential technology partners. We will elaborate on each in this final chapter.

4.1. DESIGN MATTERS

We have explained the features of smart home technology, and in particular access control, at length in this paper. But in addition to understanding what the hardware and software do, it is equally important to understand how it does it. That requires a focus on design.

When considering design, it is tempting to think about the externalities of a product. Sleek locks and sensors and a beautifully frictionless mobile app are undoubtedly impressive when viewed by a prospective resident. But as Steve Jobs famously said: *"Design is not just what it looks like and how it feels. Design is how it works."*

In a market where an ever-increasing share of buildings will be IoT-enabled, the quality of access control technologies will surely come to the fore.

The relationship between design and experience is exemplified by the products of the company that Jobs ran so successfully. Samsung and other operators make smartphones that are more feature-rich than the latest iPhone. Yet consumers remain loyal to Apple, paying substantially more for their iPhones than the Android-enabled equivalents. This loyalty has much to do with Apple's control over its software and hardware environment, where iOS is designed to optimize the hardware and vice-versa.

Morgan A. Blum, Director of Operations at Panther Residential, articulated a similar view of smart building technology: *"We evaluated several different smart building technologies, and found we had a strong preference for an integrated hardware and software platform. Most vendors provide software that controls hardware made by multiple different providers. We felt that having the additional control of truly integrated hardware and software was better for our residents and better for us from a management perspective."*

There are several reasons why the controlled hardware and software environment is appealing, particularly in the way that platforms handle changes. When one vendor provides the locks and another the software that controls them, there is the risk that any change will expose the interface between the companies. A high-priority change for the software vendor may not carry the same weight for the hardware provider, for example. Apple mitigates these risks through a combination of owning most of the technology within its "walled garden" and carefully curating integrations with other providers. Most smart building technology is not designed this way, with software companies usually providing a control layer over technology that is generally designed and created by other companies.

A highly controlled integration between hardware and software increases the potential scope of

changes to the smart home platform. Using firmware stored in individual devices, the technology provider can remotely change how its devices operate. Tesla provides a familiar example of how long-term over-the-air firmware updates to ensure that its vehicles have the latest software, security, and upgrades. Access control systems should work in the same way. Vendors capable of updating both the hardware and software components of the solution at the same time have a considerable advantage when making major security updates, for example.

While firmware updates may not be top-of-mind to apartment prospects and residents, their impact certainly is. Put simply, the stuff works! Access control is not universally seamless—far from it. In a market where an ever-increasing share of buildings will be IoT-enabled, the quality of access control technologies will surely come to the fore. As we discussed in the final subsection of the previous chapter, the quality of the experience a community can offer will play a growing role in capturing financial benefits.

4.2. EXPERIENCES ARE CHANGING

One of the most over-used quotations in the world of business is NHL legend Wayne Gretzky's sage advice to, *"Skate to where the puck is going, not where it has been."* Buyers of technology, especially those who have seen many sales presentations (including, presumably, numerous treatments of Mr. Gretzky's quote), tend naturally to focus on technology as it currently is. There are good reasons for that: future development pipelines carry the risk of not being completed. But with technology as foundational and potentially transformational as the smart home, a different perspective is needed.

Karen Hollinger of AvalonBay provided some context in a recent interview: *"About five to seven years ago, I started to see the beginning of what today we would call proptech. At that point, proptech was really more focused on operating efficiency, where today it has transformed to be a differentiator in how we develop, how we provide customer service and how we grow our revenue."*

We have already covered the way that access control currently improves revenue for operators and how that revenue justifies the technology investment. But today's investments will enable further transformation of experiences and processes for years to come. Therefore, operators need to understand how their resident experience is likely to develop in the near future if they are to make the right technology decision today.

Here, again, it is helpful to consider the student housing experience: today's students will be tomorrow's multifamily renters. Jamie Grant of L3 Campus Communities provided a student housing perspective: *"Our students use their phones for everything, so we place a high value on the quality*

"...we place a high value on the quality of the smart building mobile app experience..."

of the smart building mobile app experience. Students prefer controlling access to their apartments via their phones or smartwatches. This extends to other smart home features like thermostats: being able to control multiple aspects of the apartment through a single app is a better user experience than having to download a different app for each feature."

The integration of smart home components is an important part of the smart building strategy. Once again, one size does not fit all: a totally integrated smart home experience, connecting all IoT devices through a constantly connected hub may make sense for many apartment communities; for others, it may not. The key is to choose a flexible technology that can deliver the elements that are necessary to enable the experience without having to commit to hardware or connectivity elements that aren't.

Finally, it seems safe to bet that the mobile app will continue to be pivotal to the smart building experience, as it already is in student housing and many IoT-enabled communities. With so many services requiring apartment access, we should consider the ways that those services could become more deeply integrated into the smart home app experience. Cleaning services, dog-walkers and deliveries are obvious examples of services that could be arranged through the system that organizes building access. The opportunity exists for operators to leverage technology to curate service offers that improve their residents' living experiences.

4.3. THE VENDOR LANDSCAPE IS CHANGING

This final chapter has focused on the future proofing of smart technology investments and the design and experience elements that may be foundational to future growth. We cannot leave this topic without considering the nature of the market and the vendors currently competing for smart home technology projects.

Over the last two years, as we have written our annual 20 for '20 white papers, we have noted a shift in the vendor landscape. When we interviewed 20 multifamily executives at the end of 2019, there was a prevailing view that there were

too many smart home technology vendors in the market. This concern was particularly strong with some of the larger fee management platforms that frequently have to take over properties from other operators. Technologies that may have appeared viable a few years ago sometimes failed the test of time, creating the need to retrofit a property whose units were nearly all occupied.

The opportunity exists for operators to leverage technology to curate service offers that improve their residents' living experiences.

Smart building implementations involve putting physical equipment into multifamily communities, which increases the risk of making the wrong decision. By choosing to roll out access control and any other smart building elements, companies place a bet on the longevity of the vendors with whom they choose to partner. In a market whose vendors are still relatively immature, the level of vendor risk would be relatively high. But the vendor landscape is changing.

Over the last year, a series of events happened involving some of the sector's leading providers. In May 2020, SmartRent closed a \$60m funding round, with Amazon among the investors. A few months later, RealPage announced that it was to acquire Stratis IoT, integrating IoT technology into one of the industry's most comprehensive operating platforms. More recently, Latch (our collaborators in preparing this paper) announced their plans to become a public company through a merger with a Tishman Speyer-sponsored SPAC (Special Purpose Acquisitions Company).

These capital events are not only a crystal clear validation of multifamily smart building technology but have also created an elite subset of companies with the financial resources to build on the success already accomplished in this exciting industry space. More companies may follow, but it is hard to understate the importance of financial strength and its impact on vendor longevity when committing to such a long-range partnership.

Smart building technology is a multiple-year investment. In considering vendors, we must ask ourselves which is best equipped to deliver the desired customer experience over the long-term. Longevity entails not only financial strength but also the talent, vision and culture that define strong long-term partnerships.

AvalonBay's Karen Hollinger said in a recent interview: *"I love proptech startups. I love the creativity and the innovation, but there are two pools of proptech startups. There are those that haven't thought through the ecosystem, including cybersecurity, risk and support, and how to be a partner on a long-term basis. Then there are those who've actually considered all of those components that you can envision being a partner in your development portfolio."*

This advice and the technical and philosophical considerations of design and experience that we have discussed in this paper should shape how operators think about smart building technology and the companies they choose to partner with to bring it to their communities.

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ABOUT D2 DEMAND SOLUTIONS

D2 Demand Solutions has more than a century of experience bridging the gap between technology and people. With deep experience in rental housing and proptech, D2 has delivered game-changing programs in pricing and revenue management, sales performance, business intelligence and technology. With a focus on analysis rather than opinions, D2 delivers lasting change to its ever-growing base of leading rental housing companies and technology providers.

ABOUT LATCH

Latch is reimagining the modern buildings of today and driving evolution for the cities of tomorrow. Latch delivers a full building operating system, starting with best in class access control, designed to help owners, residents and third parties (e.g. guests, couriers, service providers) seamlessly experience the modern building through integrated software, products, and services. More than one in ten new apartments in the U.S. are being built with Latch products, with multifamily buildings in more than 35 states featuring Latch solutions and supporting more than two million unlocks per month. latch.com