

# ADOPTING BUILDING CODE STANDARDS TO INCORPORATE SMART HOME TECHNOLOGY

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I. INTRODUCTION

Building codes ensure acceptable and safe living environments, especially for low-income and unsophisticated tenants living in apartments. However, as smart home technology redefines what living environments are acceptable and safe, the building codes (“codes”) should adapt to these changes in technology.<sup>1</sup> Smart home technologies, or household products that contain controllable electronic elements,<sup>2</sup> are poised to expand rapidly over the coming years. The smart home technology market is forecasted to expand from \$24.1 billion in 2016 to

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<sup>1</sup> *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419, 440 (1982).

<sup>2</sup> While “smart home technology” is not well defined, it generally includes a vast array of new household products that replace existing ones with more sophisticated technologies. These products can be controlled in ways they previously could not, usually by using a smart phone or controller (e.g., via Amazon Alexa and Google Home). While the definition is ever changing, Investopedia recently defined a “smart home” as “a convenient home setup where appliances and devices can be automatically controlled remotely from any [I]nternet-connected place in the world using a mobile or other networked device. A smart home has its devices interconnected through the [I]nternet, and the user can control functions such as security access to the home, temperature, lighting and home theater.” James Chen, *Smart Home*, INVESTOPEDIA (last updated Jan. 22, 2018), <https://www.investopedia.com/terms/s/smart-home.asp>.

\$53.45 billion by 2022,<sup>3</sup> with products that promise to provide numerous safety, convenience, and health benefits.<sup>4</sup> Building codes have two broad purposes: (1) they set minimum requirements for habitability,<sup>5</sup> thus protecting low income and vulnerable populations from unscrupulous landlords who otherwise would seek to cut costs in construction and maintenance; and (2) they set “standard practices” for the real estate industry, protecting the industry from unfair competition and tenant legal action.<sup>6</sup> New smart home technology will improve living environments by affording the adopters with multiple safety and efficiency benefits. Indeed, at some critical point, the benefits of this technology will likely be significant enough that living environments without the technology will fall below what society establishes as the minimum habitability requirements, reflecting the pervasive spread of this technology. Unfortunately, multifamily apartments, especially those consisting of lower income residents, may not adopt smart home technology as readily as owner-occupied housing because of the economic challenges. Thus, regulation through the building codes may be necessary to provide the benefits of smart home technology to low-income multifamily apartment dwellers.<sup>7</sup>

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<sup>3</sup> *Global Smart Home Market Revenue 2016–2022, Forecast Market Size of the Global Smart Home Market from 2016 to 2022 (in Billion U.S. Dollars)*, STATISTICA, <https://www.statista.com/statistics/682204/global-smart-home-market-size/> (last visited Apr. 20, 2019).

<sup>4</sup> See Letter from the Editors, *The Smart Home is Here: What Consumers Want*, SMART HOME MAG., at 2, [https://www.housewares.org/pdf/guides/2018\\_Smart\\_Home\\_Magazine.pdf](https://www.housewares.org/pdf/guides/2018_Smart_Home_Magazine.pdf); Joseph Bradley, *There’s No Place Like (a Connected) Home*, HUFFPOST (Dec. 23, 2013, 8:55 AM), [https://www.huffpost.com/entry/internet-of-everything-connected-home\\_b\\_4491287](https://www.huffpost.com/entry/internet-of-everything-connected-home_b_4491287) (last updated Feb. 22, 2014); *Smart Home Market Size & Share Will Hit \$53.45 Billion By 2022*, ZION MARKET RES. (Apr. 12, 2017, 9:02 PM), <https://www.globenewswire.com/news-release/2017/04/12/959610/0/en/Smart-Home-Market-Size-Share-will-hit-53-45-Billion-by-2022.html>.

<sup>5</sup> See *Trs. of the Cambridge Point Condo. Tr. v. Cambridge Point, LLC*, 88 N.E.3d 1142, 1152 (Mass. 2018) (affirming that the public policy behind building codes “strongly favors the safety and habitability of homes.”).

<sup>6</sup> CAL. DIV. OF CODES & STANDARDS, DEP’T OF HOUS. & CMTY. DEV., *A GUIDE TO CALIFORNIA HOUSING CONSTRUCTION CODES* ii (2014), <http://www.hcd.ca.gov/building-standards/state-housing-law/docs/HCDSHL600.pdf> (“Improved awareness of the state laws, regulations, and building standards will improve compliance and reduce housing construction costs and delay . . . These steps . . . are adopted to benefit both builders and residents . . .”).

<sup>7</sup> For a discussion of the difficulties posed when installing smart home technology in multifamily residences, see Kellie Hughes, *The Challenge with Smart-Home Technology in Multifamily*, MULTIFAMILY EXECUTIVE (Sept. 1, 2017), [https://www.multifamilyexecutive.com/technology/the-challenge-with-smart-home-technology-in-multifamily\\_o](https://www.multifamilyexecutive.com/technology/the-challenge-with-smart-home-technology-in-multifamily_o).

In Part I of this Note, I evaluate why and how codes are currently adopted; then, in Part II, I consider three normative positions for when regulation should be adopted: (1) when not adopting would be a tort (economic analysis); (2) when the net benefit to society exceeds to cost to society (utilitarianism); and (3) when the greatest reasonable level of safety dictates regulation (paternalism). I then address in Part III the specific complications that smart home technology poses to the real estate industry, and how incorporating smart home technology into building codes could alleviate these concerns. In Part IV, I discuss how the three normative positions and relevant industry-specific factors relate to three commercially available smart home products that are growing in popularity to illustrate the principles discussed. I conclude this Note in Part V arguing for the adoption of smart home technology into building codes because the multitude of benefits it confers on landlords and tenants—especially low-income tenants—outweigh the costs of incorporating such technology.

Before progressing to the substance of this Note, I will give an introductory example to frame this conversation. Consider the following hypothetical about how to determine when a code should be implemented: Recently, door and lock companies have released “smart lock” products, many of which are available for under \$200.<sup>8</sup> These products alert homeowners of potential break-ins by starting a video feed of their front door when it detects motion.<sup>9</sup> Since the homeowners can unlock the door remotely, these products can also eliminate potentially dangerous lockouts, for instance, when children cannot get into their homes after school.<sup>10</sup> Finally, these locks can sense whether a door is completely closed,<sup>11</sup> and could help the homeowners achieve greater energy efficiency when combined/connected with a smart thermostat.<sup>12</sup> These benefits—

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<sup>8</sup> See John R. Delaney, *The Best Smart Locks for 2019*, PC MAG. (Apr. 15, 2019, 11:43 AM), <https://www.pcmag.com/article/344336/the-best-smart-locks>; Ring, *Video Doorbells*, <https://shop.ring.com/> (last visited Feb. 17, 2019).

<sup>9</sup> See, e.g., *How It Works*, AUGUST, <https://august.com/pages/how-it-works>; (last visited Apr. 20, 2019); *Video Doorbells*, RING, <https://shop.ring.com/pages/doorbells> (last visited Feb. 16, 2019).

<sup>10</sup> See RING, *supra* note 9.

<sup>11</sup> *Id.*

<sup>12</sup> JEN KING, AM. COUNCIL FOR ENERGY-EFFICIENT ECON., ENERGY IMPACTS OF SMART HOME TECHNOLOGIES 8 (2014), <https://aceee.org/sites/default/files/publications/researchreports/a1801.pdf> (“For example, a family on vacation can remotely turn off lights, turn down the thermostat, lock doors equipped with smart locks, and deactivate the defrost cycle on a smart refrigerator. . . . [Energy] savings are possible through their ability to control seamlessly the multiple lights, appliances, and electronics in the home.”).

enhancing safety and improving energy efficiency—are similar to many existing requirements and what the existing codes were enacted to achieve.<sup>13</sup> Compared to the existing codes, these products could attain even more significant benefits.

However, there are drawbacks to requiring smart home technology products such as smart locks. First, these locks may be costlier for builders to install, and only a few developers may be sufficiently versed in installing and managing the devices, which could ultimately raise rents.<sup>14</sup> Furthermore, many residents could be resistant to the new technology if they find it cumbersome and more difficult to operate than a traditional key. Finally, as with any technological advancement, the requirement could require the landlord to, once again, change all of the locks in a few years when something better comes along.<sup>15</sup> Thus, to balance the benefits and disadvantages in determining how to structure the codes, it is necessary to first understand how the codes are adopted and why the building codes exist.

## II. THE CURRENT PROCESS FOR ADOPTING BUILDING CODES<sup>16</sup>

Before evaluating whether the building codes should be expanded to include smart home technology under the three normative positions, it is important to first understand how the codes are adopted and to identify the incentives for some of the stakeholders involved in the process of defining the building codes. This background provides insight into why the codes often do not provide for the best interests of tenants, making the case that citizens and municipalities must demand implementation of smart home technology at some critical point because the building industry may not.

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<sup>13</sup> See, e.g., INT’L BLDG. CODE ch. 13 (INT’L CODE COUNCIL 2018) (providing minimum design requirements for energy efficiency); Security Requirements, CTY. L.A. DEP’T PUB. WORKS BUILDING & SAFETY DIV. (Apr. 10, 2014), <https://dpw.lacounty.gov/bsd/lib/fp/Building/General%20Documents/Security%20Requirements%202014.pdf>

(listing various requirements and specifications for security devices such as locks and grilles to improve safety when used).

<sup>14</sup> Hughes, *supra* note 7; Kovacs Zsolt, *Connected Home – Challenges in the Field and What’s Next*, TODAY SOFTWARE MAG., <https://www.todaysoftmag.com/article/1665/connected-home-challenges-in-the-field-and-what-s-next> (last visited Apr. 29, 2019).

<sup>15</sup> Hughes, *supra* note 7.

<sup>16</sup> This Note will primarily consider the International Building Code (“IBC”). Many states (notably California) release supplemental requirements that generally strengthen the codes, which they take from other groups. Many municipalities also regulate some aspects of building through their approval or denial of zoning changes.

New International Building Codes (“IBC”) are developed and approved every three years by the International Code Council (“ICC”) Board of Directors; they are then adopted in their entirety or with only minor modifications by most jurisdictions in the United States.<sup>17</sup> This consistency in the codes allows unity among codes in cities across a state and states across the country in order to reduce the burden on businesses operating across city and state lines; it also enables tenants to expect similar-quality living environments across the country.<sup>18</sup> The ICC is a non-profit organization consisting now of 64,000 members; it originally started when a group of building organizations came together to create a consistent set of requirements for new construction.<sup>19</sup> Through a decentralized process of making recommendations to a board of experts that ultimately approve the codes, the board considers the input of builders, manufacturers, architects, landlords, developers, fire officials, tenants’ rights groups, the enacting municipalities, and others.<sup>20</sup> The process by which the codes are modified is the result of local and national lobbying by interest groups, governments, and lawyers.<sup>21</sup> This process, often criticized for deferring to industry standard practice, is reactive rather than forward thinking, and therefore the resulting codes do not

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<sup>17</sup> *Overview of the International Building Code (IBC)*, INT’L CODE COUNCIL, <https://www.iccsafe.org/codes-tech-support/codes/2018-i-codes/ibc/> (last visited Feb. 16, 2019); *Code Development Process*, INT’L CODE COUNCIL, <https://www.iccsafe.org/codes-tech-support/codes/code-development/> (last visited Feb. 16, 2019).

<sup>18</sup> See *Building Industry Assn. v. City of Livermore*, 52 Cal. Rptr. 2d 902, 904–905 (Ct. App. 1996) (noting that California cities have some freedom to alter the codes, but that cities’ freedom is limited to geography-specific differences in order to promote consistency across the state); ELLEN VAUGHAN & JIM TURNER, ENVTL. & ENERGY STUDY INST., *THE VALUE AND IMPACT OF BUILDING CODES 4* (2013), <https://www.eesi.org/files/Value-and-Impact-of-Building-Codes.pdf> (stating that model building codes “establish a baseline for acceptable and cost-effective quality and performance” for building occupants).

<sup>19</sup> *About the International Code Council*, INT’L CODE COUNCIL, <https://www.iccsafe.org/about-icc/overview/about-international-code-council/> (last visited Apr. 29, 2019); Press Release, Int’l Code Council, *The Code Council Celebrates 15 Years Dedicated to Creating Safe Buildings and Resilient Communities Worldwide* (Jan. 25, 2018), <https://cdn-web.iccsafe.org/wp-content/uploads/Press-Release-15th-anniversary.pdf>.

<sup>20</sup> *ICC Consensus Procedures*, INT’L CODE COUNCIL (Dec. 7, 2018), [https://www.iccsafe.org/wp-content/uploads/Revision-of-ICC-Consensus-Procedures\\_2-of-2-revised-12.6.18B.pdf](https://www.iccsafe.org/wp-content/uploads/Revision-of-ICC-Consensus-Procedures_2-of-2-revised-12.6.18B.pdf).

<sup>21</sup> *Id.*; S. K. Ghosh, *The Building Code Process: An Introduction*, PRECAST/PRESTRESSED CONCRETE INST. J., July–Aug. 2002, at 134, 136, [http://skghoshassociates.com/sk\\_publication/PCI\\_Aug\\_Bld\\_Code\\_Proc\\_Intro.pdf](http://skghoshassociates.com/sk_publication/PCI_Aug_Bld_Code_Proc_Intro.pdf).

benefit tenants as fully as they might otherwise.<sup>22</sup> Still, the process purports to create fair building standards in the service of cities.<sup>23</sup>

#### A. THE DUAL PURPOSES OF BUILDING CODES

Broadly speaking, the dual purposes of building codes are: (1) to protect low-income populations and laypeople with little construction knowledge from abusive landlords; and (2) to create an industry-wide standard in the interest of builders.<sup>24</sup> Protecting tenants often requires additional expenses, while landlords and developers generally favor reducing expenses. These dual purposes of the codes are often in tension. Naturally, these dual purposes inform the mechanisms by which the building codes are adopted, as both of these groups vie for changes. This complex system often leads to less than optimal results.

##### 1. Tenant Protection

Given that many tenants do not have the technical knowledge and skills to evaluate the potential dangers and inefficiencies of their dwelling, the codes are necessary to provide a standard baseline for an acceptable

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<sup>22</sup> See, e.g., Forum, *The Law and Politics of Tort Reform*, 4 NEV. L. J. 377, 391 (2004) (noting that there were twenty-five lobbyists for the construction industry and only two for homeowners in Nevada).

<sup>23</sup> E.g., *Bylaws for the International Code Council, Inc., Article 1, § 1.2 General Purposes*, INT'L CODE COUNCIL, <https://cdn-web.iccsafe.org/wp-content/uploads/bylaws.pdf> (last modified Feb. 2013). The bylaws cite the purpose of the ICC as:

With respect to buildings and structures: (a) the lessening of burdens of government through the development, maintenance and publication of model statutes and standards for the use by federal, state and local governments in connection with the administration of building laws and regulations, and (b) the lessening of the burdens of government through the performance of certain services for the benefit of federal, state and local governments in connection with the administration of building law and regulation.

*Id.*

<sup>24</sup> See *United States v. U.S. Gypsum Co.*, 333 U.S. 364, 382 (1948) (discussing how license agreements revolutionized industry by standardizing sale methods, types of goods sold, and setting a minimum price); *Kennedy v. Columbia Lumber & Mfg. Co.*, 384 S.E.2d 730 (S.C. 1989) (holding that a builder is not liable when the builder has not violated a building code or deviated from industry standards). See also *supra* note 19 and accompanying text (noting that originally the ICC “was founded at the request of the design and construction industry to develop a single set of comprehensive national model codes,” tending to suggest that the “second” purpose may ultimately be more important despite the otherwise humanitarian-sounding implementation of the codes).

living environment.<sup>25</sup> Without building codes, many tenants—even educated and wealthy ones—would be apathetic about their living environment and would live in dangerous or uninhabitable environments because of their inability to distinguish between quality, safe environments and poorly built, dangerous environments.<sup>26</sup> Individuals with specific location or housing needs, or even entire groups such as low-income persons with Section 8 Housing vouchers, may also have little or no power to choose where to live, even if they do not approve of the conditions.<sup>27</sup> Without question, people that do end up in dangerous living environments, which provide a lower quality of life, are disproportionately poor people of color.<sup>28</sup> While some have admonished the building codes for forcing certain individuals and groups to adopt culturally American style dwellings,<sup>29</sup> the benefits of protecting vulnerable populations from unscrupulous landlords may outweigh the countervailing interest of sustaining those cultural traits. In any event, codes that promote innovation by favoring less restrictive performance-based standards<sup>30</sup> could provide a way for culturally distinct living environments to become as safe and efficient as standard dwellings.

Regulations occasionally go beyond safety and require developers to include certain elements that are deemed necessary in a modern society, such as natural light and plumbing.<sup>31</sup> As a specific example that is often relevant and has some of the biggest implications for smart home technologies, the building codes create requirements for energy efficiency,

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<sup>25</sup> Alfred Ng, *Tenants Worry Smart-Home Tech Could Be Abused by Landlords*, CNET (Apr. 4, 2019, 5:00 AM), <https://www.cnet.com/news/tenants-worry-smart-home-tech-could-be-abused-by-landlords/>.

<sup>26</sup> VAUGHAN & TURNER, *supra* note 18, at 3 (“Residential and commercial building codes provide a comprehensive set of minimum health, safety and energy standards for the design, construction and maintenance of new houses and buildings, and major renovations. They set an understandable and reliable floor for construction practices that reduce our vulnerability to a wide range of hazards.”).

<sup>27</sup> Terry A.C. Gray, *De-Concentrating Poverty and Promoting Mixed-Income Communities in Public Housing: The Quality Housing and Work Responsibility Act of 1998*, 11 STAN. L. & POL’Y REV. 173, 183 (1999) (finding that Section 8 vouchers are unlikely to provide tenants mobility due to the limited number of apartments that accept Section 8 vouchers).

<sup>28</sup> Ernie Hood, *Dwelling Disparities: How Poor Housing Leads to Poor Health*, 113 ENVTL. HEALTH PERSP. A310, A312 (2005); Hannah Reed, Note, *Indiana’s Public Health is in Jeopardy: Lessons to Learn from Toxic Chemical Contamination in East Chicago*, 15 IND. HEALTH L. REV. 109, 119 (2018).

<sup>29</sup> See, e.g., Rigel C. Oliveri, *Between a Rock and a Hard Place: Landlords, Latinos, Anti-Illegal Immigrant Ordinances, and Housing Discrimination*, 62 VAND. L. REV. 55, 72–125 (2009).

<sup>30</sup> See *infra* p. 566 (explaining performance-based versus prescriptive standards).

<sup>31</sup> See, e.g., CAL. CODE REGS. Tit. 22, § 78503 (2019).



thereby protecting marginalized populations because utility expenses disproportionately burden low-income individuals,<sup>32</sup> even with subsidies intending to benefit low-income populations.<sup>33</sup> It is a form of cruel irony that the least fortunate people in society pay the highest monthly utilities due to cheaply built, energy inefficient apartments.

Stricter requirements in the codes, however, may also raise building costs and the cost of rent for low-income individuals.<sup>34</sup> Thus, expanding the codes too extensively may harm low-income populations because landlords will pass the expenses incurred to meet the codes onto their tenants through increased rent.<sup>35</sup> Low-income individuals who may be satisfied living without smart home technology may end up paying for it indirectly because the cost of regulatory burdens are often passed on to consumers.<sup>36</sup> Building codes also limit developer freedom and codes requiring smart home technology today could become the outdated codes of tomorrow.<sup>37</sup>

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<sup>32</sup> ARIEL DREHOBL & LAUREN ROSS, AM. COUNCIL FOR ENERGY-EFFICIENT ECON., LIFTING THE HIGH ENERGY BURDEN IN AMERICA'S LARGEST CITIES: HOW ENERGY EFFICIENCY CAN IMPROVE LOW INCOME AND UNDERSERVED COMMUNITIES 9 (2016), <https://aceee.org/sites/default/files/publications/researchreports/u1602.pdf> (finding that low-income households pay twice as much as middle-income households and thrice as much as high-income households in energy costs); Maria Stamas, *California's Low Income Face a Disproportionate Energy Burden, But Efficiency Can Reduce It*, NAT. RESOURCES DEF. COUNCIL, INC., (Apr. 22, 2016) <https://www.nrdc.org/experts/maria-stamas/californias-low-income-face-disproportionate-energy-burden-their-better-showing>.

<sup>33</sup> *Subsidized Housing and LIHEAP*, DEP'T HEALTH & HUMAN SERV. (Nov. 2013), <https://liheapch.acf.hhs.gov/pubs/440.htm> (last updated 2016).

<sup>34</sup> John M. Quigley & Steven Raphael, *Regulation and the High Cost of Housing in California*, 95 AM. ECON. REV. 323, 327 (2005).

<sup>35</sup> *Id.* at 327–28. See generally MAC TAYLOR, LEGIS. ANALYST'S OFF., CALIFORNIA'S HIGH HOUSING COSTS: CAUSES AND CONSEQUENCES (2015), <https://lao.ca.gov/reports/2015/finance/housing-costs/housing-costs.pdf> (discussing how California's building codes are strict enough to increase the costs of materials and labor, which increases building costs, and ultimate affects home prices and rent).

<sup>36</sup> See TAYLOR, *supra* note 35 (discussing how California's building codes are strict enough to increase the costs of materials and labor, which increases building costs, and ultimate affects home prices and rent); Joseph L. Sax & Fred J. Hiestand, *Slumlordism as a Tort*, 65 MICH. L. REV. 869, 874 (1967) (noting the adverse effect that raised rents post-rehabilitation of a dwelling have on low-income tenants); Michael D. Turner, *Paradigms, Pigeonholes, and Precedent: Reflections on Regulatory Control of Residential Construction*, 23 WHITTIER L. REV. 3, 74 (2001) (pointing out that the “the exceedingly disproportionate costs arising from non-compliance and marginal building requirements” are passed down to residents).

<sup>37</sup> Jeffrey Harris et al., AM. COUNCIL FOR ENERGY-EFFICIENT ECON., RE-INVENTING BUILDING ENERGY CODES AS TECHNOLOGY AND MARKET DRIVERS 8-205 (2010) (noting that future proofing should be considered “at least for those energy systems that are reasonable to anticipate today and where it is relatively easy or cheap to prepare a new building for a possible future installation. . . . [B]uilding codes could include . . . requirements to future-proof all new construction.”).

Tenants are often poorly represented in the process of defining building codes. One primary reason is that the building codes are a prime example of “regulatory capture”: the industry being regulated by the codes has taken most of the responsibility for writing and enforcing them.<sup>38</sup> While some special interest groups purport to represent tenants, they often focus on specific aspects of the code that are personally meaningful to them. For instance, one prominent group, comprised of individuals with family members that were injured in fires or were formerly firefighters, advocates for stricter fire protection yet includes numerous board members from industry interest groups that stand to gain financially from increased fire controls.<sup>39</sup> Other groups purporting to represent tenant interests may be intimately connected to the industry. For example, window manufacturers successfully lobbied for more stringent efficiency and safety standards on behalf of tenants, which reduce tenants’ heating and cooling costs, but which also benefit the industry by raising construction costs.<sup>40</sup>

This “captured” system arises because citizens and legislatures naturally have little interest in the building codes. The codes are complex, technical, and difficult to navigate.<sup>41</sup> Furthermore, the codes may even be relatively unavailable to the general public; code publishers have attempted to reduce access by maintaining copyright control over the model codes.<sup>42</sup> Indeed, courts have often recognized that while housing

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<sup>38</sup> Turner, *supra* note 36, at 72–74. See also *Membership*, INT’L CODE COUNCIL, <https://www.iccsafe.org/membership/membership-overview/> (last visited Apr. 20, 2019) (marketing that “only ICC Members vote in the ICC Code Development Process”).

<sup>39</sup> Turner, *supra* note 36, at 42; MARTY AHRENS, NAT’L FIRE PROTECTION ASS’N, SMOKE ALARMS IN U.S. HOME FIRES (2015), <https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Detection-and-signaling/ossmokealarms.ashx?la=en> (advocating for stricter code requirements in smoke alarm implementation); *NFPA Board of Directors*, NAT’L FIRE PROTECTION ASS’N, <https://www.nfpa.org/About-NFPA/NFPA-leadership/Board-of-Directors> (last visited May 5, 2019).

<sup>40</sup> See C.C. Sullivan & Alex Abarnabel-Grossman, *Beef Up the Glazing to Meet Today’s Tough Codes*, BUILDING DESIGN & CONSTRUCTION (Mar. 23, 2016), <https://www.bdcnetwork.com/beef-glazing-meet-today’s-tough-codes-aia-course>; *WDMA Environmental Stewardship*, WINDOW & DOOR MANUFACTURERS ASS’N, <https://www.wdma.com/page/GreenZone>. The Window and Door Manufacturers Association advocates for more stringent environmental regulations that encourage adoption of glazing options which increase materials costs. Also note that window size is not regulated, while glazing is, despite smaller window size substantially increasing energy efficiency.

<sup>41</sup> James McLean & Dryver Huston, *Navigational Complexity Within Building Codes: Quantification and Affirmation*, 144 J. PROF. ISSUES ENGINEERING EDUC. & PRAC. 04018003-1, 04018003-1 (2018).

<sup>42</sup> See, e.g., *Veeck v. S. Bldg. Code Cong. Int’l, Inc.*, 293 F.3d 791 (5th Cir. 2002) (affirming the protected status of model codes produced by a model code publisher but ruling that building codes as they are adopted by municipalities are non-copyrightable facts).

likely is the largest portion of a tenant's monthly expenditures, "[t]he ordinary 'consumer' can determine little about the soundness of the construction but must rely upon the fact that the vendor-builder holds the structure out to the public as fit for use as a residence, and of being of reasonable quality."<sup>43</sup> Finally, the codes provide only limited legal rights against developers and municipalities enforcing the codes, generally applying only to new buildings; thus tenants (and their representatives) have nothing to gain by pushing for changes to improve their current living situation, since the new codes would not apply to the existing buildings in which they live.<sup>44</sup>

However, the codes are important to tenants regardless of their perception of the codes. Tenants consciously consider changing apartments very infrequently and thus are unlikely to have much long-term interest in the building codes—many may not even know the building codes exist. However, tenants benefit from the codes regardless because the codes ensure that residents—which include tenants—will have a safe living environment that is relatively consistent.

## 2. Builder Protection

Despite these seemingly noble intentions, the building codes also protect builders—recall that people in the building industry started and maintain the ICC.<sup>45</sup> At a low enough price point, tenants will generally overlook aspects of their living environment that are injurious to their health and well-being. For instance, in countries with less stringent housing requirements, some tenants live in cheap “coffin homes” as small as fifteen square feet.<sup>46</sup> Allowing anyone to live in such environments is bad for landlords because society often associates landlords with slums and shanty towns and can draw public criticism that attracts unwanted media attention.<sup>47</sup> The codes thus create a floor for the building industry as

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<sup>43</sup> *E.g.*, *Christensen v. R.D. Sell Constr. Co.*, 774 S.W.2d 535, 538 (Mo. Ct. App. 1989).

<sup>44</sup> *E.g.*, *Atherton Condo. Apt.-Owners Ass'n Bd. of Directors v. Blume Dev. Co.*, 799 P.2d 250, 266 (Wash. 1990) (citing *R. Cushman & T. Bottum, Architect and Engineer Liability: Claims Against Design Professionals* § 7.9 (1987)); *Friedberg v. Town of Longboat Key*, 504 So. 2d 52 (Fla. Dist. Ct. App. 1987).

<sup>45</sup> See *supra* note 19 and accompanying text.

<sup>46</sup> Alan Taylor, *The 'Coffin Homes' of Hong Kong*, ATLANTIC (May 16, 2017), <https://www.theatlantic.com/photo/2017/05/the-coffin-homes-of-hong-kong/526881>.

<sup>47</sup> See, e.g., Diane Lefer, *Slum Housing: LA's Hidden Health Crisis and a Model Response*, DICK & SHARON'S L.A. PROGRESSIVE (Apr. 23, 2010), <https://www.laprogressive.com/slum-housing-las-hidden-health-crisis-model-response> (criticizing certain Los Angeles landlords for their response to slum housing).

a whole, preventing certain builders from dramatically undercutting the market with cheap, nearly uninhabitable, apartments. The codes create an agreed-upon level of safety and comfort for living environments, set an industry standard for buildings, and give builders directions when making decisions.<sup>48</sup>

On the other hand, the codes often create overly prescriptive standards, thus limiting innovation in the marketplace.<sup>49</sup> Prescriptive standards outline in precise detail what is allowed,<sup>50</sup> such that innovation is nearly impossible.<sup>51</sup> The codes seem to explicitly favor this prescriptive method. For instance, they often provide two options: design-based codes and performance-based codes.<sup>52</sup> Under prescriptive design-based codes, the developer must follow a set of rules, such as using specific materials, building techniques, and verification processes when constructing a project.<sup>53</sup> Performance-based codes, on the other hand, are tied to actual performance in the field and allow developers to build more creative structures, as long as it can be proven that the building as a whole exceeds the design-based codes.<sup>54</sup> Unfortunately, constructing a building with performance-based codes is rarely done because it is significantly more expensive and time-consuming.<sup>55</sup> The result is that design-based codes create a system of highly specific rules or standards that outline the minimum requirements, with little incentive for the developer to exceed the prescriptive requirement.<sup>56</sup>

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<sup>48</sup> See generally, e.g., CAL. DIV. OF CODES & STANDARDS, *supra* note 6 (explaining state laws, regulations, and construction codes applicable to housing construction in California).

<sup>49</sup> Jeffrey Pike, Note, *A Tale of Two Codes: The Influence of Albuquerque and Washington on Green Building*, 41 B.C. ENVTL. AFF. L. REV. 201, 230–31 (2014) (“In addition to providing room for innovation, performance-based codes are more effective than prescriptive-based codes. Prescriptive standards are by their nature pre-defined and rigid. Because of their carefully defined nature, prescriptive requirements leave little creativity to the developer. As a result, building officials tend to prefer prescriptive standards for their clarity and ease of use.”); *California Discards Prescriptive Path to Green Buildings*, ENERGY DESIGN UPDATE, April 2010, at 1, 3.

<sup>50</sup> While in theory the codes create “minimums,” often it is hard to know what the “minimum” is because, as ever in life, there are tradeoffs. For instance, while using more wood might increase the stability of the building, it may also raise the fire risk. Thus the “minimum” wood structure, even ignoring the cost pressures put on developers, tends to become the required wood structure.

<sup>51</sup> Pike, *supra* note 49, at 231.

<sup>52</sup> *Id.* at 216.

<sup>53</sup> *Id.*

<sup>54</sup> *Id.* at 217.

<sup>55</sup> Jennifer Senick, *A New Paradigm for Building Codes*, CONSORTIUM FOR BUILDING ENERGY INNOVATION, <http://cbei.psu.edu/ceb-codes-performance-based-codes/> (last visited Feb. 17, 2019).

<sup>56</sup> *Id.*

Turning now to some of the incentives for the various interest groups, builders and developers prefer relatively weak codes reflecting industry standard, because they often use them to protect themselves from potential litigation, unfair competition, and public scrutiny.<sup>57</sup> Stakeholders from the real estate industry as a whole prefer that once a large enough portion of the market moves towards standards that the codes reflect those standards then prevent a lone developer from choosing a cheaper option and undercutting the market.<sup>58</sup> Still, even while some regulation is beneficial to it, the real estate industry generally favors less regulation because less regulation generally lowers construction costs;<sup>59</sup> as a result, they are unlikely to support building codes that adopt smart home technology. Because reducing the requirements places the least onus on developers, to the extent developers pass regulatory compliance costs on to their tenants, it reduces rent burdens on tenants.

Creating standard practices within the building industry and incorporating them into the codes protects builders from tenant lawsuits and complaints. Most building products are overwhelmingly standardized and based on industry-specific requirements, which benefits builders by creating consistency with installation and price. For instance, the building codes and regulations surrounding construction set a firm guide that, if followed, provide a nearly irrefutable rebuttal to any allegation of uninhabitability that a tenant or inspector could make (although jurisdictions are split on whether violating a building code presents a *per se* presumption of negligence, nearly all find that it is evidence of negligence).<sup>60</sup> Builders would prefer to standardize their own practices, and since builders' unions are a significant stakeholder in the building code development process, implementing standard practice into the code is relatively uncontroversial, while building industries may litigate against

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<sup>57</sup> *Id.* See also *Sullivan v. Pulte Home Corp.*, 354 P.3d 424, 427 (Ariz. Ct. App. 2015) (discussing that developers lack tort liability because Building Code disclaimed intentions to benefit or protect any particular groups).

<sup>58</sup> See Glenda Taylor, *Are Uniform Building Codes Good or Bad for Small Businesses?*, CHRON, <https://smallbusiness.chron.com/uniform-building-codes-good-bad-small-businesses-38234.html> (last visited Apr. 21, 2019).

<sup>59</sup> Nat'l Ass'n of Home Builders, *Builders Tell Congress: Progress on Regulatory Reform, But the Job is Not Done*, NAHB NOW (Mar. 7, 2018), <http://nahbnow.com/2018/03/builders-tell-congress-progress-on-regulatory-reform-but-job-is-not-done/>.

<sup>60</sup> 1 JAMES ACRET & ANNETTE DAVIS PERROCHET, *CONSTRUCTION L. DIGESTS* § 13:4, Westlaw (database updated May 2018).

stricter codes.<sup>61</sup> Thus, developers are unlikely to support codes that force implementation of smart home technology that is not standard, changes quickly, and provides limited increase in rent. Developing new architectural styles and construction methods may take decades,<sup>62</sup> ensuring that builders and landlords have time to adopt the codes, whereas smart home technology, as a product of the tech industry, moves quickly.<sup>63</sup> Nevertheless, as particular developers remain successful over time, their specific practices will become the de facto industry standard.<sup>64</sup> In that light, waiting for the slow process of becoming industry standard produces an economically efficient result. However, the misaligned incentives between developers and tenants are likely to introduce inefficiencies, which prevent adoption of smart home technology.<sup>65</sup>

Even if adopting standard practice was economically efficient, deferring too much to powerful business interest groups tends to undermine one primary purpose of the building codes: to keep the quality of the living environment high. The builders and landlords who create the “industry standard” often have perverse incentives to maintain the status quo of their buildings. Where private industry groups lobby the industry to accept more stringent codes, these industry groups often aim to increase the price of housing and sell their goods by requiring more expensive items with uncertain benefits to the population, thus undermining the intent of the code to protect tenants.<sup>66</sup>

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<sup>61</sup> *Bldg. Indus. Assn. of Washington v. Wash. State Bldg. Code Council*, 10-5373RJB, 2010 WL 11561392, at \*1 (W.D. Wash. July 29, 2010); Carla Williams, *Building Code Pros and Cons: Is the System in Need of an Overhaul?*, CONSTRUCTION DIVE (May 20, 2016), <https://www.constructiondive.com/news/building-code-pros-and-cons-is-the-system-in-need-of-an-overhaul/419457/>.

<sup>62</sup> *E.g.*, WORLD ECON. F., SHAPING THE FUTURE OF CONSTRUCTION: A BREAKTHROUGH IN MINDSET AND TECHNOLOGY 5 (May 2016), [http://www3.weforum.org/docs/WEF\\_Shaping\\_the\\_Future\\_of\\_Construction\\_full\\_report\\_.pdf](http://www3.weforum.org/docs/WEF_Shaping_the_Future_of_Construction_full_report_.pdf) (pointing out that the construction industry adapts slowly and promoting concepts for increased speed and sophistication).

<sup>63</sup> Maxwell Browne, *How Smart Home Technology is Being Integrated in Real Estate*, THRIVE GLOBAL (Mar. 27, 2019), <https://thriveglobal.com/stories/how-smart-home-technology-is-being-integrated-in-real-estate/>.

<sup>64</sup> WORLD ECON. F., *supra* note 62, at 12 (“Eventually, the firms with strong processes in place and the ability to adapt their business models to new markets will prove to be the winners. Many of the others will disappear.”).

<sup>65</sup> LUCA CASTELLAZZI ET AL., JOINT RESEARCH CENTRE, OVERCOMING THE SPLIT INCENTIVE BARRIER IN THE BUILDING SECTOR 2 (2017), <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101251/ldna28058enn.pdf>.

<sup>66</sup> *See, e.g.*, Darren A. Prum et al., *In Third Parties We Trust? The Growing Antitrust Impact of Third-Party Green Building Certification Systems for State and Local Governments*, 27 J. ENVTL. L. & LITIG. 191, 219–220 (2012).

In practice, builders often use the codes as bare minimum standards by which they construct their buildings.<sup>67</sup> Rarely do builders or developers exceed the requirements of every single code,<sup>68</sup> which is one reason why smart home technology may need to be required rather than adopted as economic forces allow. Even in luxury buildings, builders prefer to do the bare minimum with respect to aspects for which tenants are expected to pay higher rent.<sup>69</sup> One reason for this is that margins are thin and builders are beholden to the desires of their investors, as well as to strict qualification from quasi-governmental mortgage backers.<sup>70</sup> Any developer who chooses to build above requirement of the codes would need to justify their extra costs with either higher rent or increased efficiency—otherwise, investors are likely to finance other developers. Since potential residents are unlikely to pay additional rent for features that are not discernable during the leasing process (usually including a walkthrough), developers are likely pressured to skimp on these invisible aspects as financial pressure from investors focuses on projects more likely to yield the greatest return on the investment.<sup>71</sup>

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<sup>67</sup> DIV. OF CODES & STANDARDS, *supra* note 6, at 3.

<sup>68</sup> Turner, *supra* note 36, at 75; Williams, *supra* note 61.

<sup>69</sup> For instance, the National Electrical Code requires electrical outlets every 5.5 feet. NAT'L ELECTRICAL CODE § 210.52 (2017), <https://archive.org/details/gov.law.nfpa.nec.2017/page/n111>. However, it would make sense to put multiple outlets near the T.V. or entertainment console and fewer throughout the hallway. Still, most of us know the pain of searching for a place to plug something in. In part, this is because almost no tenant considers electrical outlet placement when selecting an apartment.

<sup>70</sup> C.J. Hughes, *For Developers, the Return of Diminishing Returns*, REAL DEAL (Sept. 16, 2007, 12:14 PM), [https://therealdeal.com/issues\\_articles/for-developers-the-return-of-diminishing-returns/](https://therealdeal.com/issues_articles/for-developers-the-return-of-diminishing-returns/). See also, e.g., *Mortgage Insurance for Rental and Cooperative Housing: Section 221(D)(4)*, DEP'T HOUSING & URBAN DEV., [https://www.hud.gov/program\\_offices/housing/mfh/progdsc/rentcoopshg221d3n4](https://www.hud.gov/program_offices/housing/mfh/progdsc/rentcoopshg221d3n4); Bill Kitchens, *Size Matters: Investigating Operating Expenses Across Multifamily Product*, REALPAGE (Jun. 23, 2016), <https://www.realpage.com/analytics/size-matters-investigating-operating-expenses-across-multifamily-product/>. See Cezary Podkul, *U.S. Pursues One of the Biggest Mortgage-Fraud Probes Since the Financial Crisis*, WALL ST. J. (Aug. 15, 2018), <https://www.wsj.com/articles/u-s-pursues-one-of-the-biggest-mortgage-fraud-probes-since-the-financial-crisis-1534357872> (describing how developers committed fraud to qualify for multifamily loans with strict requirements, indicating the financial pressures placed on developers by secondary mortgage markets).

<sup>71</sup> Kitchens, *supra* note 70 (noting the importance of expense ratios in valuing apartment buildings for future investment, thus implying the importance of reducing expenses by cutting construction costs).

## B. MUNICIPALITIES

The municipalities enacting the building codes have additional incentives beyond those of the developers and tenants. While sensitive to the desires of the residents, the code must also be simple and inexpensive to enact. Legislatures prefer uncontroversial regulations, so the codes generally exclude items that may attract undue attention from builders or radical changes that may be unpopular with the residents.<sup>72</sup> This generally reinforces the importance of standard practice in defining the codes. Municipalities favor very narrowly tailored codes that can be easily inspected by inspectors and interpreted by the courts to reduce potential liability,<sup>73</sup> but the wide range of smart home technology and its complexity makes it difficult to evaluate, such that it may prove too challenging for local jurisdictions. While municipalities like the consistency of the IBC across jurisdictions,<sup>74</sup> they also often view the building codes as an important guardian of local culture and customs and for whatever reason, or no reason at all, they may modify the codes of a city to suit their preferences.<sup>75</sup> Finally, cities and states share some of the same desires as citizens insofar as citizens vote for their elected officials; however, considering that citizens often have limited interest in the building codes, their elected officials are not likely to be interested either. Consequently, the decisionmakers are often unsophisticated and care about other issues, leading them to choose the least controversial path, which is often simply adopting most of the IBC.<sup>76</sup>

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<sup>72</sup> For example, if a city's building code were to require smart thermostats, it might cause public outrage, especially among an elderly population unfamiliar with the operations, low-income households unable to finance the necessary infrastructure, and developers with lower budgets.

<sup>73</sup> See generally Thomas M. Fleming, Annotation, *Municipal Liability for Negligent Performance of Building Inspector's Duties*, 24 A.L.R.5th 200 (1994 & Supp. 2018) (providing a repository of cases on municipal liability stemming from negligent inspections not in conformity with building codes).

<sup>74</sup> CAL. HEALTH & SAFETY CODE § 17922 (West 2017) (requiring California municipalities to adopt "substantially the same requirements" as the International Building Codes unless local conditions require variations to reduce building costs); MAYOR'S ADVISORY COMM'N, NYC DEP'T OF BLDGS., REPORT ON THE ADOPTION OF A MODEL BUILDING CODE 34 (2003), <http://www.mzarchitects.com/wp-content/uploads/2012/04/ibc.pdf> (recommending that New York City adopt the International Building Codes to create consistency across jurisdictions).

<sup>75</sup> For instance, the city of Pella, Iowa requires Dutch-themed fronts on their commercial buildings. DESIGN REVIEW DISTRICT DESIGN MANUAL, CTY. OF PELLA 15 (3d ed.), <https://www.cityofpella.com/DocumentCenter/Home/View/188> ("Building facades of all buildings shall be consistent with the character, massing, volume, and materials of the building typology.") (last visited Apr. 21, 2019).

<sup>76</sup> Many large cities do employ engineers and other construction officials that modify the code, which the city then votes to enact, providing some level of local control. Despite this, the volume of the IBC and similar model codes simply is too large for cities to re-write them.



## III. POSITIONS AS APPLIED TO DEFINING BUILDING CODES

Building codes are laws, just like any other law. While they are untraditional because of their specificity and prescriptive nature,<sup>77</sup> potential expansions to the building codes that encourage the adoption of technology nonetheless can be analyzed using some of the same normative frameworks that are well established for evaluating the law. While there are several normative philosophies under which to analyze whether or not the building codes should expand to require smart home technology, this Note describes three ways of evaluating this question and applies them to smart home technologies: standard tort analysis, utilitarianism, and greatest reasonable level of safety. These three normative frameworks explained in greater detail below stem roughly from some of the most prevalent applied law and economics theories of this century, such as the theories by Posner,<sup>78</sup> Singer,<sup>79</sup> and Rawls.<sup>80</sup>

## A. STANDARD TORT ANALYSIS

If we consider the construction of a living environment to be a “product” of the landlord, then, when determining when a code should be enacted, the principles of tort and products liability laws are a convenient starting point.<sup>81</sup> The “BPL Formula” or “Hand Rule,” frequently employed in tort analysis, states that someone who owes another person a duty of care is liable to that person if the burden of eliminating a potential for loss

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Usually the building officials may suggest changes as requested by the developers they interact with daily, or based on changes other nearby cities make.

<sup>77</sup> For instance, while the criminal law says “murder is illegal,” it does not prescribe how not to commit murder. The building codes, on the other hand, say with some degree of specificity “this is how to build.”

<sup>78</sup> See Richard A. Posner & William M. Landes, *The Positive Economic Theory of Tort Law*, 15 GA. L. REV. 851, 851 (1980) (exploring the positive economic theory of tort law, which hypothesizes that “the common law is best explained as if the judges who created the law through decisions operating as precedents in subsequent cases were trying to promote efficient resource allocation.”).

<sup>79</sup> See PETER SINGER, PRACTICAL ETHICS 1 (3d ed. 2011) (exploring “the application of ethics or morality . . . to practical issues”).

<sup>80</sup> See generally JOHN RAWLS, A THEORY OF JUSTICE (rev. ed. 1999) (advancing an alternative to utilitarianism that considers the individual rights and liberties of all citizens “as free and equal persons” and claiming that the supposed tradeoff between freedom and equality is non-existent in a system of “justice as fairness.”).

<sup>81</sup> *Sullivan v. Pulte Home Corp.*, 354 P.3d 424, 425 (Ariz. Ct. App. 2015) (where “homeowners . . . contend that a public policy-based tort duty arises from a municipal building code, as well as from statutes and regulations governing residential contractors.”); STEVEN B. LESSER ET AL., FLORIDA CONDOMINIUM AND COMMUNITY ASSOCIATION LAW § 17.1 (4th ed. 2018).

is less than the probability of loss, multiplied by the magnitude of the loss, provided no exception applies.<sup>82</sup> Because codes and regulations can be *per se* indicators of liability in construction defect litigation, the codes and regulations arguably should reflect the tort liability standard.<sup>83</sup> Indeed, certain building codes create a right of action against landlords when they do not adhere to the building codes in their buildings.<sup>84</sup> Thus, a builder or landlord in a standard tort context could be liable for not implementing smart home technologies in a building when the extent of loss due to a sub-par living environment, multiplied by the probability of loss, exceeds the cost of preventing the loss before the fact. This methodology would reduce the total cost of a landlord's decisions to all parties. While the landlord may shift the costs of adhering to the codes onto tenants through increased rent, if the BPL analysis is accurate, then preventing the potential damage to tenants would outweigh the costs passed on to the tenants in rent. Because so few cases are litigated, litigation is costly, and most burdens that a landlord might avoid do not result in a loss in every case the point where failure to implement the smart home technology would be a tort should be established as the point of regulation. In other words, externalities prevent a functioning tort system<sup>85</sup> and the building codes should step in to fix those externalities.

Determining the optimal code requirement under BPL analysis in an isolated situation is relatively straightforward and intuitively appealing. It places the burden of preventing losses on builders and landlords, who are more aware of the best practices for building homes. Tenants are generally apathetic about invisible safety and structural features when selecting a place to live.<sup>86</sup> Because of this, landlords are unlikely to provide smart home options until they are required to because installing the expensive technology will make them less economically competitive. Creating a burden for all landlords uniformly through the building codes creates the appropriate requirement for all of society and ensures that landlords who would invest in smart home technology, but for its cost, are not penalized

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<sup>82</sup> *United States v. Carroll Towing Co.*, 159 F.2d 169, 173 (2d. Cir. 1947) (Hand, J.).

<sup>83</sup> See Sax & Hiestand, *supra* note 36, at 889–99; Peter L. Kahn, *Regulation and Simple Arithmetic: Shifting the Perspective on Tort Reform*, 72 N.C. L. REV. 1129, 1136 (1994) (“What this critical view does not take into account, however, is that the tort system, and in particular the products liability regime, which most closely duplicates the concerns of federal health and safety regulation, today offsets much of the impact of federal health and safety regulation.”).

<sup>84</sup> See 1 ACRET & PERROCHET, *supra* note 60, at § 16 (consisting of “other causes” of action to be brought against landlords).

<sup>85</sup> See Sax & Hiestand, *supra* note 36, at 913.

<sup>86</sup> See *supra* p. 569.

for providing safe living environments. It also ensures that the costs of safety can be adequately distributed between landlords and tenants in the long run, as landlords can pass costs onto tenants more easily than tenants can shift the burden back to landlords.

Builders and landlords are also more capable of improving their buildings with smart home technology. Tenants are generally not allowed to change smoke detectors, fire extinguishers, outlets, or other built-in features of their apartment.<sup>87</sup> Additionally, the relatively high upfront capital costs of installing advanced smart home technology are more easily borne by builders and investors with access to large amounts of capital and with tax incentives for improvements to their buildings.<sup>88</sup> Finally, because smart home technology often may be a fixture<sup>89</sup> of a piece of property that belongs to the landlord rather than the tenant, the expense should be the responsibility of the builder or landlord. This would inhibit tenants from spending a large amount of money installing smart home technology that would then be challenging to remove from the property when they leave, transforming the tenant's investment into something that ultimately benefits the landlord.

Generally, analysis under the tort framework requires an understanding of risk and prevention mechanisms, and unsurprisingly, many of the same criticisms from tort law apply. While this sort of analysis is particularly relevant in situations where the safety of tenants or their property is at stake, it may not extend beyond the obvious hazards. For instance, appropriately valuing a human life to determine when to implement a lifesaving technology is controversial.<sup>90</sup> Additionally, certain products may come with risks that are either not fully appreciated when the new product becomes available or are so unrelated to other risks that determining which option to require would be a challenge. For example,

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<sup>87</sup> Jennifer Maughan, *Tenant Home Improvements Without Landlord Permission*, RENT PREP (May 3, 2016), <https://www.rentprep.com/property-maintenance/tenant-home-improvements> (last updated Jan. 3, 2019).

<sup>88</sup> See 26 U.S.C.A. § 167 (West, Westlaw through Pub. L. No. 115-442) (providing tax treatment of depreciation expenses, providing an opportunity for businesses to depreciate business expenses for favorable taxation). See also Ethan Yale, *When Are Capitalization Exceptions Justified?*, 57 TAX L. REV. 549, 602 (2004) (describing how depreciating a repair may be more tax advantageous than expensing).

<sup>89</sup> See *infra* Part IV(A) for a discussion of smart thermostats, which would likely be considered fixtures while the phone or smart device used to control it would not be.

<sup>90</sup> See generally Mark A. Glick, *The Law and Economics of Tort Damages*, 9 UTAH B.J. 8 (1996) (comparing different methods for valuing injuries or life and noting the tensions between them and their supporters).

most modern fire detectors contain trace amounts of nuclear material,<sup>91</sup> and LED lights contain lead<sup>92</sup>—while both contain only trace amounts of these hazardous materials at a safe level, the risk-benefit assessment in both cases requires a disturbing tradeoff of human life. Finally, there is a limit to standard tort analysis in that many life-improving benefits of smart home technology do not create a potential for loss of life when they are not implemented; instead, they simply do not provide all the benefits any modern tenant could or should have. Thus, we turn to a further-reaching utilitarian analysis.

### B. UTILITARIANISM

A similar economic analysis logically extends to actions that would result in benefits to society as a whole in the form of reduced cost, increased convenience, or a higher quality of life. Implementation based on the utilitarian theories of philosophers like Peter Singer<sup>93</sup> would eliminate many of the misaligned incentives between developers and tenants by forcing the wealthy developers to subsume some of the costs.<sup>94</sup> Under this utilitarian theory, where implementation of a certain technology produces a net positive impact for society (in terms of economics, happiness, and comfort), a code should be implemented to require that technology.<sup>95</sup> Many commentators have struggled to define happiness and other valuable yet non-monetary items, so application of

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<sup>91</sup> See, e.g., R. BELANGER ET. AL, U.S. NUCLEAR REGULATORY COMM'N, ENVIRONMENTAL ASSESSMENT OF IONIZATION CHAMBER SMOKE DETECTORS CONTAINING AM-241 1-5 (1979) (finding that the ratio of the potential lives lost due to possible fatal cancers was one cancer death per 15,000–51,000 deaths by fire).

<sup>92</sup> Seong-Rin Lim et al., *Potential Environmental Impacts of Light-Emitting Diodes (LEDs): Metallic Resources, Toxicity, and Hazardous Waste Classification*, 45 ENVTL. SCI. & TECH. 320, 320 (2011) (noting that LEDs do not provide lifesaving benefits, but do expose users to hazardous chemicals, indicating at some level a tradeoff between human life and energy efficiency).

<sup>93</sup> For a brief description of utilitarianism as a philosophy see generally KATARZYNA DE LAZARI-REDEK & PETER SINGER, UTILITARIANISM: A VERY SHORT INTRODUCTION (2017) (arguing that human suffering ought to be reduced in the most efficient manner possible to maximize hedonic utility).

<sup>94</sup> In a true Singer utopia, developers would likely be taxed at a higher rate and their income would be redistributed to their poor tenants. Far from advocating that, this Note merely points out that technologies should be implemented where the net economic benefit on society of implementation is positive.

<sup>95</sup> See PHILIP L. BRUNER & PATRICK J. O'CONNOR, JR., BRUNER & O'CONNOR ON CONSTRUCTION LAW § 19:10, Westlaw (database updated June 2018).

utilitarianism is complex.<sup>96</sup> Still, there are some situations in which the economic cost to society of non-implementation is so great that there can be little debate that society as a whole would be better off if developers installed smart home technology broadly. Additionally, while it has regularly been shown that Adam Smith's invisible hand theory does not adequately describe real-world scenarios implicating happiness, it is still a convenient proxy to assume that willingness to spend money is connected to societal value.<sup>97</sup> For instance, if a tenant values a device enough to pay for it, but there are barriers to installation, the developer should be required to install that technology.<sup>98</sup> Any additional cost passed onto the consumer would be acceptable because of the increased value the item provides.

While it is reasonable to assume tenants would buy new technology when it reduces their overall economic burden, landlords are unlikely to implement such technology because of misaligned incentives.<sup>99</sup> As an example, utility bills are generally paid by tenants whereas developers install the equipment that uses energy. Indeed, if tenants were sophisticated consumers and the economic benefit from installing a technology, for instance, new windows, outweighed the cost of the windows, tenants would install the technology regardless of whether a landlord did so.<sup>100</sup> Tenants, however, may not live in one place long enough to pay off their investment in the new windows.<sup>101</sup> Also, in most apartments tenants do not have the ability to make certain changes without authority from the landlord, even though tenants generally end up paying the monthly cost of utilities.<sup>102</sup> The devices themselves also create barriers

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<sup>96</sup> For instance, philosopher Jeremy Bentham historically struggled with this concept trying to assign "utils" to various life choices before conceding that certain pleasures simply could not be measured by a quantitative happiness system. See, e.g., Robert W. McGee, *Legal Ethics, Business Ethics, and International Trade: Some Neglected Issues*, 10 CARDOZO J. INT'L & COMP. L. 109, 112–15 (2002).

<sup>97</sup> 1 ADAM SMITH, *THE THEORY OF MORAL SENTIMENTS* 248–49 (Wells & Lilly 1817) (1759). See also CHARLES MONTGOMERY, *HAPPY CITY* 78–84 (2013); Chris Matthews, *The 'Invisible Hand' Has an Iron Grip on America*, FORTUNE (Aug. 13, 2014), <http://fortune.com/2014/08/13/invisible-hand-american-economy> (discussing criticisms by economists of the invisible hand theory and misinterpretations of the theory).

<sup>98</sup> For instance, CAL. GOV. CODE § 65850.7 requires developers to install electric vehicle charging ports if a user is willing to pay for installation. Codes like this could force developers unwilling to install smart home technology to do it if a tenant is willing to pay for it.

<sup>99</sup> See CASTELLAZZI ET AL., *supra* note 65, at 3.

<sup>100</sup> *Id.*

<sup>101</sup> See Maughan, *supra* note 87.

<sup>102</sup> Lucas W. Davis, *Evaluating the Slow Adoption of Energy Efficient Investments: Are Renters Less Likely to Have Energy Efficient Appliances?*, in *THE DESIGN AND IMPLEMENTATION OF*

for developers; because of the wide variety and quality of available smart home products, the many divergent systems to control the devices, and the tenant's personal preferences, the landlord is unlikely to spend significant money on a device that the occupant cannot use or does not like. Because of these challenges, the benefits that would be bestowed on the tenant—whether in the form of reduced cost of living or a higher quality of life if they used the product—may not be realized, thus discouraging installation of the costly devices.

While Adam Smith's invisible hand theory would suggest that tenants will buy their own products when the expected utility surpasses the cost, there are numerous reasons why it is more economically efficient for developers to be tasked with instituting smart home technology. This is because developers are more aware of new products, are financially more capable of implementing them, are not restricted from making changes like most tenants, and stand to benefit if the dwelling unit is rented to another party. Thus, the building codes should require the developer to bear the expenses of implementing technology when its implementation creates a net benefit to society. While month-to-month utility bills in excess of what they could be are generally not considered a "loss," they are a very real expense for millions of Americans.<sup>103</sup> Likewise, life-improving benefits such as convenience or comfort are not considered a "loss," which might complicate analysis under a tort framework but would require implementation under utilitarianism. Only once those benefits are viewed as necessities, rather than luxuries, could a tenant make an argument the technology should be required under the tort framework—for example, one hundred years ago hot water was not considered a necessity, yet now a tenant could sue a landlord for failing to provide hot water.<sup>104</sup> But under a utilitarian framework, a tenant should expect the most convenient and comfortable living environment a society believes should be afforded.

This sort of utilitarian analysis is not without limitations. If every socially favorable change was required, it would be difficult to keep up with new products consistently coming to market. For instance, the high

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U.S. CLIMATE POLICY 301, 304 (Don Fullerton & Catherine Wolfram, eds. 2012); Arik Levinson & Scott Niemann, *Energy Use by Apartment Tenants When Landlords Pay for Utilities*, 26 RESOURCE & ENERGY ECON. 51, 68–69 (2004).

<sup>103</sup> See, e.g., *Where Does My Money Go?*, ENERGY STAR, [https://www.energystar.gov/products/where\\_does\\_my\\_money\\_go?s=mega](https://www.energystar.gov/products/where_does_my_money_go?s=mega) (last visited Apr. 30, 2019) (calculating the average annual energy bill for a single-family home as \$2,090).

<sup>104</sup> H.J. Long, *The Water Heater*, METAL WORKER, PLUMBER, & STEAM FITTER, Vol. 65, 1906, at 47.

up-front cost of fluorescent light bulbs, which are dramatically cheaper over time (four years) than incandescent light bulbs,<sup>105</sup> should already have been required across the United States under a utilitarian analysis. But as LED light bulbs—another dramatic improvement over fluorescent bulbs—entered the scene in 2014, they became a more economically efficient option.<sup>106</sup> The whiplash created here is that fluorescent light bulbs installed in 2011 never paid themselves off over the incandescent bulbs because within four years, an even better light bulb was available. This rapid technological advancement makes it very difficult to require new smart home technology, even if the technology has value for society. The costs of implementing every new favorable technology may face another problem; even though tenants may be *willing* to pay more, they may not be *able* to pay more.

Furthermore, while the example of light bulb technology is straightforward, and the benefits and costs are relatively easy to calculate, a wide range of technologies with overlapping uses may make deciding which to include in the code difficult. Different tenants may have different preferences—for instance, disliking the color of light a fluorescent bulb gives off—making it difficult to define what is “socially valuable.” Short of creating identical, communist-style housing based on what an average tenant wants (which would probably satisfy no one), there is no way to truly define “utilitarian” housing. While environmental concerns and other concepts that have understandable tradeoffs are prone to utilitarian analysis, they quickly run amuck; is a long, hot shower socially valuable even if it contributes to warming the planet through the release of greenhouse gases or causes a water shortage? Should low-flow showerheads be required, or can a developer install nicer showerheads for those people that like long, hot showers? Thus, while utilitarian analysis is often useful as a philosophical framework, its practical applications are limited. Still, as I will demonstrate through the examples in Part IV, there are certain times when there should be relatively little disagreement about the value of implementing a technology for society and most everyone

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<sup>105</sup> See *Fluorescent (CFL) vs. Incandescent Bulbs*, DIFFEN, [https://www.diffen.com/difference/Fluorescent\\_Bulbs\\_vs\\_Incandescent\\_Bulbs](https://www.diffen.com/difference/Fluorescent_Bulbs_vs_Incandescent_Bulbs) (last visited Apr. 30, 2019) (showing that although fluorescent light bulbs are more expensive up-front than incandescent bulbs, a single bulb can last nearly four years (35,000 hours) compared to the 83 days (2,000 hours) of an incandescent bulb).

<sup>106</sup> Joe Romm, *5 Charts That Illustrate the Remarkable LED Lighting Revolution*, THINK PROGRESS (Aug. 2, 2016, 4:09 PM), <https://thinkprogress.org/5-charts-that-illustrate-the-remarkable-led-lighting-revolution-83ecb6c1f472>.

believes it should be done, so we should embrace those opportunities by requiring smart home technology in the building codes.

As a short aside, various authorities have attempted to encourage the adoption of certain technologies by manipulating the economics through offering tax credits and rebates.<sup>107</sup> While these programs create a motivation for owner-occupied housing and developers by providing additional economic incentive, the cost to society may be greater than if the developer were simply required to install the device because the government is spending money via rebates to encourage introduction of technology that economics might already favor. These rebates may also punish early adopters that implemented the technology before a rebate was created or prevent the next wave of improvement by encouraging adoption of a less beneficial technology that is soon to be replaced (e.g., the fluorescent light bulb in a world of LEDs). Additionally, rebates and tax credits are generally not available to renters and have been criticized for providing disproportionate benefits to the wealthy.<sup>108</sup> Thus, under the utilitarian framework there is also a social justice purpose for redistributing developers' wealth in the interests of tenants when the overall society benefits from implementation.

### C. GREATEST REASONABLE LEVEL OF IMPLEMENTATION

The final position I will consider for when codes should be adopted results in the highest level of safety and "greatest" quality of environment for tenants. In order to best serve the first of the dual purposes of the building codes (to protect the health, safety, and comfort of citizens), one goal of the building codes could be to expand the codes to provide the greatest reasonable level of implementation, only taking into consideration costs that severely limit use or otherwise would impair residents' health.<sup>109</sup> For example, it may be that an early earthquake detection and alarm

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<sup>107</sup> E.g., *2017 Non-Business Energy Property Tax Credits*, ENERGY STAR, [https://www.energystar.gov/about/federal\\_tax\\_credits/2017\\_non\\_business\\_energy\\_property\\_tax\\_credits](https://www.energystar.gov/about/federal_tax_credits/2017_non_business_energy_property_tax_credits) (last visited Feb. 19, 2019).

<sup>108</sup> Dan Quinley, *More Power to the Wealthy: Renewable Energy Tax Programs, Market Distortions, and the Ramifications on the Cost of Electricity*, 40 ENVIRONS: ENVTL. L. & POL'Y J. 185, 217 (2017).

<sup>109</sup> For instance, under this framework, if a tenant's rent is increased by \$10 a month, but said increase was associated with positive health outcomes comparable to payment of \$20 for something else, it might be acceptable; however, an increase by \$100 a month that results in the same \$20 benefit elsewhere might not.



system installed in a home (similar to those found in Mexico City)<sup>110</sup> could save hundreds of lives. Regardless of the potential cost to users, the legislature could decide to install the system. Under this position, building codes would be adopted as soon as possible to create better living environments for tenants, regardless of the costs. Under this framework, the purpose of providing the best living environments to tenants takes priority over the other potential purposes of the building codes. It replaces the consumer apathy problem by forcing builders to implement products—regardless of consumer preference—in order to shape the way we live. On the other hand, this framework does not give consumers who are less technologically savvy an option to avoid smart home technology—certainly some people will find the inclusion of technology in the home an invasion by “big brother.” Thus, many people may resist the smart home technology, or be harmed by it under this position. Notwithstanding, this approach would create the greatest reasonable level of housing that modern technology could provide.

In the past, costs did not stop regulators from encouraging lifesaving technologies through regulation. For instance, smoke alarms were widely implemented through regulation during the 1970s and 1980s.<sup>111</sup> Before the National Fire Protection Association (“NFPA”) passed and distributed the Life Safety Code (“NFPA 101”) in 1976, requiring fire alarms in homes, few homes had smoke alarms.<sup>112</sup> In 1980, just four years later, 50% of homes in the United States reported having smoke alarms, and by 1985 the number rose to 75%.<sup>113</sup> In 2013, 96% of homes were estimated to have working smoke alarms.<sup>114</sup> The model used to regulate smoke alarms into existence illustrates that certain health and safety regulations cannot be based on economic forces because the benefits, such as saving lives, are not loss-based and not utilitarian issues, nor are they reflective of tort damages. Instead, the codes must be implemented proactively because the potential consequences are disastrous if not implemented, and most tenants will not insist on the products due to apathy and lack of knowledge. Fires, earthquakes, and hurricanes, for instance, strike rarely and unpredictably, so tenants (especially low-income tenants with few options) turn a blind eye to the potential risks and do not generally make

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<sup>110</sup> Colin Wood, *Is Mexico’s Earthquake Early Warning System a Model for the World?*, GOV’T TECH.: EMERGENCY MGMT. (Apr. 30, 2014), <https://www.govtech.com/em/disaster/Mexicos-Earthquake-Early-Warning-System.html>.

<sup>111</sup> AHRENS, *supra* note 39, at 7.

<sup>112</sup> *Id.*

<sup>113</sup> *Id.* at 1.

<sup>114</sup> *Id.*

living choices based on remote dangers.<sup>115</sup> Thus the codes require fire, earthquake, and hurricane-resistant designs because without regulations requiring these elements, landlords would be unlikely to incorporate them into their buildings, since tenants simply will not pay for them.<sup>116</sup> Adoption of new technology required by regulation, such as was required for smoke detectors in the 1970s, may be necessary to overcome the misaligned interests between landlords and apathetic tenants even today.

One key distinction between smart home technology and existing technology, which creates challenges for regulated implementation, is that smart home technology products are seen as a luxury and not a necessity. Companies marketing smart home products believe that the value they provide is great enough that consumers will purchase their products. While the additional value provided by smart home products may be sufficient to encourage adoption by many people, people who are less likely to purchase the technology (likely older individuals)<sup>117</sup> will end up living in inferior living conditions relative to those who did purchase these products.

Despite the protective value that might be recognized, implementing smart home technology in building codes is complicated because the existing codes are seen as “acceptable” and any additional benefit, no matter how large, is seen as a bonus. As an exercise in thought, imagine 10,000 people a year die in fires without smoke alarms, and adding smoke alarms cuts the number of deaths to a quarter. This new technology would save 7,500 lives. Then, another new smoke alarm technology is introduced, which cuts the number of deaths in fourth again, from 2,500 to 650, this time only saving 1,850 lives. While, proportionally, four times as

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<sup>115</sup> See Gina Yannitell Reinhardt, *Why People Stay in Disaster-Prone Cities*, CONVERSATION (Oct. 6, 2017, 6:28 AM), <http://theconversation.com/why-people-stay-in-disaster-prone-cities-84882>.

<sup>116</sup> Kevin Simmons, *Hurricane-Proofing Florida Homes Is Worth the Cost, and Then Some*, WASH. POST (Oct. 16, 2018), [https://www.washingtonpost.com/weather/2018/10/16/hurricane-proofing-florida-homes-is-worth-cost-then-some/?noredirect=on&utm\\_term=.75dd2a0d8b6e](https://www.washingtonpost.com/weather/2018/10/16/hurricane-proofing-florida-homes-is-worth-cost-then-some/?noredirect=on&utm_term=.75dd2a0d8b6e) (“Building resilient homes does add cost, and the most expensive part of the code is the impact-protection provision. So it’s understandable that communities wanting to protect affordability would resist actions that make building a home more expensive.”)

<sup>117</sup> See PRICEWATERHOUSE COOPER, SMART HOME, SEAMLESS LIFE 6 (2017), <https://www.pwc.com/us/en/industry/entertainment-media/publications/consumer-intelligence-series/assets/pwc-consumer-intelligence-series-iot-connected-home.pdf> (noting that high-income consumers were more likely to use smart home technology and demonstrating that consumers in the 50–64 age range—the highest age range captured in the study—were the least likely to use smart home technology); Chuck Martin, *Income Level Impacts Smart Home Purchasing*, MEDIAPOST (Feb. 8, 2018), <https://www.mediapost.com/publications/article/314209/income-level-impacts-smart-home-purchasing.html>.

many people are saved in both scenarios, due to diminishing marginal utility, the benefit of additional increases in safety eventually become so minimal (maybe only saving a few lives) that they appear less justifiable, especially if they require additional expenses. At a practical level, the more common a problem is, the more likely that consumers will either be personally affected by the problem or know someone who was, and the more likely they are to act to resolve it. On the other hand, if a consumer is unlikely to be affected by the problem because existing technology partially solves the problem, it may be difficult to make the case to legislators to implement a new technology requirement into the building codes—even if implementing the technology would be beneficial and proportionally comparable to past technological advancements.

To force adoption, the benefits of smart home technology must be well-documented and significant enough that tenant interest groups can persuade legislatures to hold landlords responsible when the new technology is not implemented. However, this is unlikely to extend to all forms of smart home products. Certain smart home items, such as robotic vacuum cleaners or surround-sound speakers, which provide time-saving and lifestyle benefits, will probably never be seen as a necessity no matter how beneficial they may be to the quality of a living environment (imagine never vacuuming again!). But smart home products that have lifesaving benefits or benefit society as a whole are well positioned for codes requiring their implementation, even before they become economically viable. It is well established that if a technology is life-saving or beneficial to the health of the community, legislatures have discretion to make changes to the law, even if that requires placing significant burdens on developers.<sup>118</sup> The existing technology, however, may be seen as “acceptable” and new technologies may have less noticeable overall impacts (e.g. fewer people dying), even if they are proportionally the same as past improvements (e.g. four times as effective). Even today, certain smart home technologies may already be more significant improvements than past technologies were, despite being considered a luxury.<sup>119</sup> With time, society’s tolerance of death and other

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<sup>118</sup> *E.g.*, *Builders Ass’n of Minnesota v. City of St. Paul*, 819 N.W.2d 172, 178 (Minn. Ct. App. 2012).

<sup>119</sup> *See, e.g.*, Antonio Villas-Boas, *I’ve Been Living in a Smart Home for 2 Years — And I Probably Will for the Rest of My Life*, BUS. INSIDER (Aug. 2, 2018, 9:15 AM), <https://www.businessinsider.com/smart-home-devices-are-worth-it-2018-8>. (noting that, for example, a smart doorbell can cost about \$200 but allows homeowners to double-check they locked their door and remotely check the camera feed when there is a visitor—a large increase in capabilities from a normal lock).

negative consequences created by the current standard building codes could decrease, making it easier to require new smart home technology products without angering citizens.

On the other hand, it may be that implementation of smart home technology through building codes subverts normal market forces, which could potentially lead to non-optimal solutions. Because it is difficult to identify the best long-term economically favored solution, the government bodies enacting the codes would essentially be choosing technologies to be successful at the expense of others. While much has been said about how important smoke alarms have been to providing safe living environments, there is some evidence published by the blog *Freakonomics* that the benefits of smoke alarms may actually be significantly lower than originally believed in multifamily residences that employ less advanced, older, and cheaper detection technologies.<sup>120</sup> Therefore, a less beneficial technology may be selected to “win,” which could discourage implementation in the future, both essential in this rapidly developing field.<sup>121</sup> While the long-term goal of smart home technology implementation in multifamily residences is to benefit tenants and homeowners, forced adoption of smart home technology products while they are new and expensive may subvert market forces in unintended ways. By changing the building codes and favoring certain technologies, the government could frustrate competition and innovation in the smart home and green products industry.<sup>122</sup>

In many respects, however, this subversion of market forces already happens because the efficiencies that smart home technology could provide are limited by overly-prescriptive requirements.<sup>123</sup> These prescriptive requirements create rules for building that give the tenant the same benefit a new technology would, using a different mechanism.<sup>124</sup> Unfortunately, despite new, better technology on the market, the old

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<sup>120</sup> Essentially, poor people have fewer working smoke alarms and are also exposed to more fires. A troubling finding is that in apartment buildings (where low-income people are often concentrated), smoke alarms are responsible for only an 18% reduction in deaths, compared to a 56% reduction overall. Stephen J. Dubner, *How Many Lives Do Smoke Alarms Really Save?*, FREAKONOMICS (Feb. 6, 2012, 11:32 AM), <http://freakonomics.com/2012/02/06/how-many-lives-do-smoke-alarms-really-save>.

<sup>121</sup> Sharon Oster & John M. Quigley, *Regulatory Barriers to the Diffusion of Innovation: Some Evidence from Building Codes*, 8 BELL J. ECON. 361, 361–63 (1977).

<sup>122</sup> Zachary Liscow & Quentin Karpilow, *Innovation Snowballing and Climate Law*, 95 WASH. U.L. REV. 387, 435 (2017).

<sup>123</sup> See Keith H. Hirokawa, *At Home with Nature: Early Reflections on Green Building Laws and the Transformation of the Built Environment*, 39 ENVTL. L. 507, 540 (2009).

<sup>124</sup> See Turner, *supra* note 36, at 73.

requirement still exists so someone desiring to implement the new technology would have to implement new along with old, increasing the total cost.<sup>125</sup> Adoption of smart home technology in its infant stages likely will often run into this issue, dramatically increasing the cost of providing housing especially because the cost of new smart home technology is so high. To prevent this economic preemption, building codes should create exceptions for smart home technology where possible.

#### IV. COMPLICATIONS SPECIFIC TO SMART HOME TECHNOLOGY

##### A. ASPECTS TO CONSIDER ABOUT THE INDUSTRY

Smart home technology faces several challenges that are unique to the process by which it is created and adopted into the building codes, unlike the traditional interworking of the building industry. For one, smart home technology often is a product of high-tech companies rather than traditional building product manufacturers. These high-tech companies largely view their technologies and products as a luxury that consumers will bring into their home once they provide lifestyle benefits commensurate with their price.<sup>126</sup> While these companies are not new to the lobbying game,<sup>127</sup> many do not feel that they should participate in the existing trade groups and lobby in different ways, preferring instead to “disrupt” the industry in ways that are unconventional to the building industry.<sup>128</sup> The smart home product market is characterized by intense competition and a desire by individual companies to market their entire system of products, rather than to market individual products that

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<sup>125</sup> See, e.g., *In re Trump on the Ocean, LLC v. Cortes-Vasquez*, 908 N.Y.S.2d 694, 706 (N.Y. App. Div. 2010) (Roman, J., dissenting) (noting the developer’s argument that sliding glass door technology exceeded the standard for oceanside development, but that the court found that the building administration could still deny a permit).

<sup>126</sup> Ariel Adams, *Are Tech Toys the New Luxury Goods?*, FORBES (Feb. 28, 2013, 9:15 AM), <https://www.forbes.com/sites/arieladams/2013/02/28/are-tech-toys-the-new-luxury-goods/>.

<sup>127</sup> See Brian Fung & Hamza Shaban, *To Understand How Dominant Tech Companies Are, See What They Lobby For*, L.A. TIMES (Sept. 1, 2017, 12:55 PM), <http://www.latimes.com/business/technology/la-fi-tn-silicon-valley-lobbying-20170901-story.html> (discussing the lobbying activities of large tech companies such as Google, Apple, Uber, and Facebook).

<sup>128</sup> Martyn Williams, *Silicon Valley Startups Discover the Power of Political Lobbying*, COMPUTERWORLD (Dec. 3, 2014, 3:28 PM), <https://www.computerworld.com/article/2855096/silicon-valley-startups-discover-the-power-of-political-lobbying.html>.

cooperate with other systems.<sup>129</sup> Thus, the full benefits that could be achieved by incorporating smart home technology are often not realized because products fail to work together,<sup>130</sup> in the same way that Microsoft and Apple products have historically been incompatible. In fact, the building codes themselves may need to require inter-system compatibility between smart home products in order to prevent monopolistic competition, or dangerous situations<sup>131</sup> where smart home products cannot communicate with one another.<sup>132</sup>

The building codes should expand to regulate internet-connected devices because the codes would consequently consider the combination of all smart home devices, rather than each individual product, and because building codes are more adaptable to local conditions. Certain law-creating bodies—primarily state and federal groups—have considered adding smart home products to existing “product” laws, especially with regard to privacy concerns.<sup>133</sup> While aspects of smart home technology should be regulated at a product level, the granular control that the local building codes offer allows for adaption to regional factors such as climate, density, and culture.<sup>134</sup>

#### B. OVERLY PRESCRIPTIVE RULES

Further, many building codes are overly prescriptive, defining with particularity the types of products that may be used in construction but potentially inhibiting innovative solutions. These prescriptive codes either specifically prohibit conceivable smart home devices or they make the

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<sup>129</sup> Simson Garfinkel, *Smart Home Devices Need to Get a Lot Smarter*, MIT TECH. REV. (Jun. 30, 2014), <https://www.technologyreview.com/s/528696/smart-home-devices-need-to-get-a-lot-smarter/>.

<sup>130</sup> *Id.*

<sup>131</sup> For instance, a smart fire alarm could talk to a smart lock and unlock the door in case of an interior fire, preventing tenants from being locked in. That said, if no one is home, thieves could conceivably start fires causing the home to unlock. Thus, a smart occupancy sensor could talk to the lock to determine whether to unlock or not in the event of a fire. If none of these systems were cooperative, however, a dangerous situation could be created.

<sup>132</sup> Stacey Higginbotham, *The Smart Home's Problem Is Its Best Product Is Terrible and Made by a Bankrupt Company*, FORTUNE (Oct. 16, 2015), <http://fortune.com/2015/10/16/smart-home-problems/> (noting that the biggest problem is that no company has been able to successfully bridge smart home products together).

<sup>133</sup> Anna Karapetyan, Note, *Developing a Balanced Privacy Framework*, 27 S. CAL. REV. L. & SOC. JUST. 165, 193–95 (2018) (explaining existing FTC regulations to protect consumer privacy); John McKinlay & Peter McLaughlin, *The Smart Home Legal Framework*, DLA PIPER (2015), <https://www.dlapiper.com/~media/files/insights/events/2015/10/iot-smart-home-v5.pdf>.

<sup>134</sup> For instance, smart thermostats in California should have very different settings than smart thermostats in Minnesota due to differences in their respective climates.

implementation of these devices economically impractical. Generally, these overly prescriptive codes stem from a desire to create manageable and enforceable codes. For instance, an inspector evaluating the habitability of the apartment units under the relevant interior lighting requirements<sup>135</sup> is probably not authorized or given the proper tools to assert the belief that smart lights simulating outdoor lighting sufficiently compensate for otherwise low levels of natural light (assuming that some tenants would feel equally content with either natural or simulated natural light).<sup>136</sup> Thus, even if the lights were included, the expensive proposition of adding larger windows in addition to the costs of providing the smart lights would be more costly than just providing the lights. Since administrative ease tends to favor bright-line rules, which add expenses that innovation itself could counteract, the end result is that innovative solutions become economically reasonable less frequently.

At the very least, building codes should not prevent the smart home industry from innovating and creating beneficial technology, and therefore, exclusions or exceptions should be included in the code for smart home technology, which would encourage its implementation. Even if a single product acting alone does not meet the requirements, multiple products acting together may create an acceptable situation.<sup>137</sup> Builders often use adherence to building codes as a *per se* defense against defects, so including exceptions in the code for innovative implementation of smart home technology, provided that the codes require a performance based measure that is equivalent, would encourage builders to adopt advancements without fear that they may become liable.

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<sup>135</sup> INT'L CODE COUNCIL, 2015 INT'L BUILDING CODE § 402.1 (3d prtg. 2015).

<sup>136</sup> See, e.g., *Parks Props. v. Maury Cty.*, 70 S.W.3d 735, 747 (Tenn. Ct. App. 2001) (holding that a building official and planning commission did not have the authority to grant variations from automatic sprinkler requirements when the Standard Building Code did not vest them with that authority).

<sup>137</sup> As an example, an oven that could detect fires, sound an alarm, and turn off, might be safer than different fire alarms in the kitchen, but it would not suffice under the code to replace the other fire alarm in the kitchen, since all fire alarms in California must be approved by the State Fire Marshal and be located near the ceiling. CAL. HEALTH & SAFETY CODE § 13113.7(d)(3) (West 2018). See also, THOMAS T. STREET & FREDERICK W. WILLIAMS, NAVAL RESEARCH LABORATORY, THE IMPLEMENTATION AND DEMONSTRATION OF FLAME DETECTION AND WIRELESS COMMUNICATIONS IN A CONSUMER APPLIANCE TO IMPROVE FIRE DETECTION CAPABILITIES (2007).

## V. APPLYING THE NORMATIVE FRAMEWORKS TO THREE CURRENT TECHNOLOGIES

The positions for evaluating when a building code should be adopted vary by circumstance, depending on the type of smart home product. Using the frameworks described above, I will argue when and how certain major classes of smart home products should be regulated by the codes. I will consider the importance of safety, anticipated expense of the products, and the practical limitations of enacting the codes by evaluating the likely positions of various stakeholders. The three technologies I have selected are widely anticipated smart home products and most are commercially available. These technologies are smart thermostats, smart fenestration (such as windows), and smart fire alarms. From these products, a variety of conclusions can be made about other potential smart technology products; however, because this field is rapidly changing, the full scope of the smart home technology market over the next twenty years is impossible to predict.

### A. SMART THERMOSTATS<sup>138</sup>

#### 1. Background

A variety of codes reference heating and cooling systems (“HVAC”), however, relatively little attention is given to thermostats, which control the systems.<sup>139</sup> In 1976 and 1977, California passed the first appliance efficiency regulations, providing a required level of efficiency for new air conditioners and heating units.<sup>140</sup> Each subsequent iteration of HVAC units has spawned extensive regulation, although old heating units are generally not phased out or prohibited for decades because of the high upfront cost of these systems. For example, in California, old heating and

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<sup>138</sup> Many smart thermostats like Nest, Ecobee, and Lyric are all available for under \$300. Megan Wollerton, *11 Smart Thermostats to Make Your Home the Right Temperature*, CNET (Aug. 27, 2018, 9:00 AM), <https://www.cnet.com/news/smart-thermostat-roundup>. These devices have seen some of the highest levels of implementation in housing, reaching almost 13% in 2017. John Liu, *Ownership of Smart Thermostat Reaches 13% in the U.S.*, ASMAG (Jan. 22, 2018), <https://www.asmag.com/showpost/26461.aspx>.

<sup>139</sup> See 2005 CAL. RESIDENTIAL COMPLIANCE MANUAL, 4. BUILDING HVAC REQUIREMENTS 4-33–4-34, [https://www.energy.ca.gov/2005publications/CEC-400-2005-005/chapters\\_4q/4\\_Building\\_HVAC.pdf](https://www.energy.ca.gov/2005publications/CEC-400-2005-005/chapters_4q/4_Building_HVAC.pdf) (including only one page of requirements for thermostats in a 45 page long document). See also *id.* at 4-6 (noting the exception provided for smart thermostats as an example of effective exceptions).

<sup>140</sup> *Historical Regulations & Rulemakings*, CAL. ENERGY COMM’N, [http://www.energy.ca.gov/appliances/previous\\_regulations.html](http://www.energy.ca.gov/appliances/previous_regulations.html) (last visited Aug. 25, 2018).



cooling systems are acceptable as long as they meet the standards in place at the time they were manufactured.<sup>141</sup> Changes to heating and cooling system codes are particularly challenging because of the high investment costs associated with these systems (an average of \$5,000 per furnace).<sup>142</sup> Smart thermostats, however, require less expensive modification to existing systems. Rather than strictly requiring implementation of smart thermostat systems, many jurisdictions and utilities offer rebates and tax credits in hopes of making modifications more economically feasible in the short term.<sup>143</sup> Smart thermostats are some of the most commercially successful smart home devices because of the value they provide in terms of comfort and cost savings, and yet they are still considered a luxury item. These devices are found in less than 5.3% of homes.<sup>144</sup>

## 2. Analysis Under the Positions

Requiring smart thermostats when the likely costs of failing to install the smart thermostats would exceed the burden to implement the technology would be difficult because there is no well-defined “loss” to the tenant. While increased utility bills or inconvenience could be considered losses, neither of these losses are similar to the types defined in traditional tort litigation. Under a tort theory, there is probably no affirmative duty to prevent a loss due to higher utility bills because the tenant presumably assumed the risk of utility bills by moving in to the apartment. The most that we could probably say is that a landlord should not prevent a tenant that wants a smart thermostat from installing one. Even if the landlord does have a duty to reduce the tenant’s energy bills by reducing unnecessarily inefficient systems, smart thermostats like Nest or Lyric allow the exact same furnaces and air conditioners to be more efficient by adjusting themselves automatically.<sup>145</sup> Installing a smart thermostat on average reduces heating and cooling costs by 10–12%, but it could conceivably have no impact on a specific person’s heating bill if

<sup>141</sup> *Id.*

<sup>142</sup> *Heating & Cooling Cost Guides*, HOME ADVISOR, <https://www.homeadvisor.com/cost/heating-and-cooling/> (last visited Mar. 18, 2018).

<sup>143</sup> *See* SoCal Gas, THERMOSTAT MARKETPLACE, [https://marketplace.socalgas.com/thermostats/?sortBy=relevance&utm\\_source=google&utm\\_medium=cpc&utm\\_campaign=1374034697&utm\\_keyword=smart%20thermostat&utm\\_device=c&utm\\_placement=&utm\\_network=g&gclid=EAIaIQobChMIoPzy4emZ4gIVmMpkCh39PQ9FEAAyAAEgJLuvD\\_BwE](https://marketplace.socalgas.com/thermostats/?sortBy=relevance&utm_source=google&utm_medium=cpc&utm_campaign=1374034697&utm_keyword=smart%20thermostat&utm_device=c&utm_placement=&utm_network=g&gclid=EAIaIQobChMIoPzy4emZ4gIVmMpkCh39PQ9FEAAyAAEgJLuvD_BwE) (last visited May 13, 2019) (including many smart thermostats with a \$75 rebate available).

<sup>144</sup> *There’s No Place Like [A Connected] Home*, *supra* note 4.

<sup>145</sup> Wollerton, *supra* note 138.

careful monitoring of the thermostat already installed was occurring in the household.<sup>146</sup> It would seem unfair to require such an individual or landlord to invest in a smart thermostat. Therefore, the responsibility seems to lay with the tenant under a BPL analysis, rather than the landlord, because monitoring the temperature of a dwelling is ultimately up to the tenant. Thus, under the theory that the codes should prevent what could be a tort, smart thermostats should not be required because only the tenants themselves are responsible for preventing the types of losses that smart thermostats protect against.

Assuming the major benefit of smart thermostat systems is reducing energy costs, under the utilitarian theory described, smart thermostats should be required when the economic burden to landlords, tenants, and society altogether is less than their cost. The codes should require landlords to install smart thermostats in new buildings or replace old systems with new systems that are more energy efficient once there is an economic incentive to do so. Otherwise, since property owners often pass off costs to tenants through utility bills, the landlord has no economic incentive to implement smart home technology. Non-tech-savvy people are also unlikely to seek out a smart thermostat unless they are explicitly required to because of the high upfront cost, even when they would benefit economically by doing so; a recent study found an average in savings of \$72 a year for an initial investment of \$100–300.<sup>147</sup> Furthermore, both landlords and tenants should be responsible to society as a whole when their decisions create negative externalities borne by society, such as environmental costs. Therefore, looking at the whole economic system, there is a relatively identifiable point at which point smart thermostat systems are a good investment. From a practical standpoint, however, given the high upfront cost of changes to HVAC systems once smart thermostats are first, on average, a wise investment, and second, work with existing systems, they should be required in new construction or when replacing old systems.

Under the idea that the highest reasonable living environment should be required by the codes, whether smart thermostats are a reasonable addition to the codes is questionable. Smart thermostats provide

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<sup>146</sup> M.B. Grant, *How Much Money Can You Save With a Smart Thermostat?*, SMART THERMOSTAT GUIDE (May 10, 2015), <https://smarththermostatguide.com/how-and-how-much-money-you-can-save-with-a-smart-thermostat/>.

<sup>147</sup> Samantha Sine, *Smart Thermostats Boast Greener Benefits with Energy and Cost Savings*, AIR CONDITIONING, HEATING & REFRIGERATION NEWS (Oct. 23, 2017), <https://www.achrnews.com/articles/135862-smart-thermostats-boast-greener-benefits-with-energy-and-cost-savings>.

outstanding energy savings as compared to the cost of installation; indeed, that is one reason these devices are so commercially successful. As a whole, society benefits from widespread implementation of smart thermostats by reducing energy consumption and the related negative environment effects. Society must be prepared, however, to take a stance that reduction in energy consumption is a beneficial goal—which is unfortunately far from the standard assumption.<sup>148</sup> Furthermore, many individuals, especially people who are not technologically savvy, may not feel that smart thermostats improve their comfort because they do not know how to use the technology appropriately. Finally, selecting to require smart thermostats over other energy-saving technology, especially future technology that may be more beneficial, is a challenge.

### 3. Other Considerations

Under the frameworks described, it seems like smart thermostats should be required, or should be under serious consideration, for inclusion in the next new building codes. However, defining when the benefits are significant enough to require the technology is not as straightforward because of the wide variety of existing systems, buildings, and climates. Regulating these devices is incredibly difficult; smart thermostats have a variety of algorithms accounting for comfort, energy efficiency, and lifestyle, which users ultimately control. And simply requiring a “smart device” would present complications due to the varying degrees of “smartness” of products on the market, as there exists a large range in exactly how “smart” some devices are.

The smart thermostat industry is highly competitive and controlled by certain major competitors, thus preventing cooperation. A common complaint of one popular smart thermostat, Nest, is that because the company is controlled by Google, it does not provide support for Apple HomeKit software or other control devices.<sup>149</sup> Someone with an Apple iPhone, therefore, cannot get the most out of the Nest. This competition and exclusion also makes it complicated to define what the code should require. If the code required a smart thermostat, but only a fraction of the population could use the device as intended, developers would have to decide which types of products to install. Suddenly, there are buildings

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<sup>148</sup> *But see* Recognizing the Duty of the Federal Government to Create a Green New Deal, H.R. Res. 109, 116th Cong. (2019).

<sup>149</sup> Tim Hardwick, *HomeKit Support for Nest Smart Products Unlikely Anytime Soon*, MAC RUMORS (Jun. 16, 2017), <https://www.macrumors.com/2017/06/16/homekit-support-nest-unlikely-anytime-soon/>.

dedicated to each of the various major technology companies, leading to untenable situations.

Finally, because the algorithms used by the devices are fiercely guarded by the software companies selling them, it is difficult to create requirements for how the devices operate. One smart device may be significantly more efficient than a “dumber” device, or one algorithm could work best for single people in Florida while another works better for a family in Alaska. Finally, one app may prioritize comfort over efficiency and would not be as efficient. Thus, simply requiring a “smart thermostat” may not successfully achieve the anticipated benefits. There are a number of codes that potentially confound the implementation of smart thermostats. For instance, central heating and air in many large apartment buildings includes heat exchangers and advanced HVAC systems that may not work with existing smart thermostats targeted to the mass market. In such instances, the existing systems may be more energy efficient than a less-advanced system that includes a smart thermostat.

## B. SMART FENESTRATION AND AUTOMATIC BLINDS<sup>150</sup>

### 1. Background

Fenestration regulation is primarily designed with three purposes in mind: to ensure security, reduce environmental burdens, and create more comfortable indoor areas.<sup>151</sup> The environmental concerns are generally efficiency-based and mirror those of heating and cooling systems.<sup>152</sup> However, the codes give wide latitude to builders and landlords because windows and window coverings are design characteristics occupants often consider when selecting an apartment. Decisions in this arena are almost always made by the developer, not the consumer, because fenestration is a complicated and technical field. Smart fenestration is considered a luxury

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<sup>150</sup> Smart fenestration and automatic blinds are window coverings that improve energy efficiency and promote privacy and a comfortable living environment. While these devices offer impressive heating and cooling potential, a window shade that opens to reveal the morning sun as an alarm is lodged in many people’s mind as a vision of the future. Commercially available options generally exceed \$100 per window. James Stables, *How to Get Started with Smart Blinds*, THE AMBIENT (Dec. 24, 2018), <https://www.the-ambient.com/guides/best-smart-blinds-homekit-alexa-448>.

<sup>151</sup> See *Fenestration*, CONDOPEdia, <http://www.condopedia.com/wiki/Fenestration> (last visited May 2, 2019).

<sup>152</sup> See, e.g., Tom Herron, *Windows that Reduce Peak Cooling Loads Reduce Costs*, NAT’L FENESTRATION RATING COUNCIL (Oct. 7, 2014), <http://www.nfrccommunity.org/blogpost/925129/199218/Windows-that-Reduce-Peak-Cooling-Loads-Reduce-Costs>.

item, in addition to entailing many aesthetic choices.<sup>153</sup> Therefore, creating a building code to require smart window coverings would be difficult.

## 2. Analysis Under the Positions

The many benefits that could come with smart fenestration are similar to the benefits of heating and cooling systems. However, tort analysis fails for many of the same reasons as it did in the previous example of smart thermostats. Because fenestration is based on climate and building design and varies based on price, builders and landlords will have a different economic calculation for each client, so no “average” would be sufficient.<sup>154</sup> Furthermore, while there is a conceivable “loss” due to increased utility bills, the loss is variable based on building type and styles. That said, smart fenestration does provide certain security benefits by providing privacy and verifying that windows and doors are locked. These benefits are easy to analyze under the tort BPL framework because the types of losses that are caused by faulty security mechanisms are well understood.<sup>155</sup> Still, due to the cost of these systems and the relative infrequency of losses that could actually be prevented, it is unlikely that smart fenestration would ever be required under a tort justification.

Even though fenestration and window coverings are generally seen as decorative, automatic window shades can reduce energy costs even more than smart thermostats (about 20 percent).<sup>156</sup> Despite these long-term savings, people are unlikely to accept codes requiring them to install smart fenestration, even if economically favorable, because windows and window coverings are seen as giving a space character and expressing an individual’s preferences.<sup>157</sup> Fenestration is generally non-economically motivated—the upfront cost of a window is significantly greater than the

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<sup>153</sup> Emily Kay Thompson, *The Luxury of Automation*, WINDOW & DOOR (May 9, 2016), <https://windowanddoor.com/article/may-2016/luxury-automation>.

<sup>154</sup> Chris Gunn, *Energy Efficient Window Attachments*, U.S. DEP’T OF ENERGY, <https://www.energy.gov/energysaver/energy-efficient-window-attachments> (last visited Feb. 21, 2019).

<sup>155</sup> See, e.g., *McCarty v. Pheasant Run, Inc.*, 826 F.2d 1554 (7th Cir. 1987), a famous tort case wherein the sliding door of a hotel room had a faulty lock through which an intruder entered and attacked the plaintiff.

<sup>156</sup> Gunn, *supra* note 154.

<sup>157</sup> The codes do place some requirements on interior window shades specifically related to egress and fire safety. INT’L CODE COUNCIL, 2018 INT’L BUILDING CODE § 1015.8 (2017).

cost of a wall.<sup>158</sup> Indeed, if economics were all that mattered, then the ideal window would be a solid wall. Still, windows themselves make utilitarian sense because tenants like spaces with natural light, and the benefits of a comfortable home might be intangible and not felt broadly in society. If tenants want smart fenestration, it is likely that they would be willing to pay extra rent for it, thus encouraging landlords to offer apartments with this technology. Therefore, while the codes should not require smart fenestration from an economic standpoint, personal choices may still result in the economically favored fenestration option if there are not misaligned incentives.

### 3. Other Considerations

Changes to the fenestration industry are particularly driven by powerful lobbying groups like the American Architectural Manufacturers Association (“AAMA”) and the Window and Door Manufacturers Association (“WDMA”).<sup>159</sup> Changes to the fenestration code are the result of the internal processes of these groups, which tend to prefer reflexive changes to the building codes that protect their industry. Fenestration manufacturers appreciate the security that comes with stringent regulations on their industry because it raises barriers to entry for smaller competitors. Regulations requiring or encouraging this more complicated technology are likely to be proffered as smart fenestration becomes more widely available. Fenestration products are widely seen as a luxury item and can be extremely expensive. Therefore, the codes should adopt exceptions for certain products and focus the majority of their emphasis on inexpensive windows to prevent low-income tenants from paying increased monthly utility bills.

Automatic windows or blinds programmed to increase household energy efficiency could be required because they offer a higher quality of life. Most jurisdictions regulate the transmission of energy through the glass of newly installed windows by requiring various coatings on the glass.<sup>160</sup> However, shades and blinds are not regulated, even though a

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<sup>158</sup> Window Installation Costs, Home Advisor, <https://www.homeadvisor.com/cost/doors-and-windows/install-windows> (last visited Feb. 21, 2019) (average window installation cost for five to ten windows is \$4,900).

<sup>159</sup> Julie Ruth, *International Code Requirements for Windows & Doors*, WINDOW & DOOR (Sept. 17, 2008), <https://windowanddoor.com/article/codes-standards/international-code-requirements-windows-doors>.

<sup>160</sup> See INT’L CODE COUNCIL, 2015 EXISTING INTERNATIONAL BUSINESS CODE § 104.2.2 (5th prt. 2015) (requiring that inspection of the fenestration and the required U-Factor be taken at installation).

person that adjusts window shades constantly throughout the day may be far more effective at increasing energy efficiency than coatings on window glass.<sup>161</sup> Given that existing standards require coatings, the additional expense of window coverings is less reasonable because window coverings and glass coatings do similar things.<sup>162</sup> From this it can be seen that legislatures have already selected a technology (glass coatings) that confounds the benefits that could be seen with smart fenestration.

### C. FIRE ALARMS AND OTHER DISASTER MONITORING<sup>163</sup>

#### 1. Background

Fire alarms and other disaster monitoring devices are often the easiest elements to require prior to wide-scale adoption of the technology. Legislators and citizens generally accept protections that save lives, despite the cost. Currently, fire alarms and smoke detectors are required in almost every jurisdiction.<sup>164</sup> Still, the devices required are very basic alerting systems with placement requirements. Any change to these standards is likely to result in some pushback due to increased cost. This is because moving to even more advanced technology does not yield the same gross benefits that requiring earlier technology did, even if by percentage it is more significant than past improvements.<sup>165</sup>

#### 2. Analysis Under the Positions

Under a tort analysis, builders and landlords should be responsible for implementing smart alarms when the risk of a disaster exceeds that of the burden of preventing or reducing the disaster. While, under existing tort law, it is likely that builders already have a burden to provide a reasonable level of safety, which may include providing smart alarms, the

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<sup>161</sup> See HUNTER DOUGLAS, ENERGY SAVINGS FROM WINDOW SHADES 20 (2015), [https://rmi.org/wp-content/uploads/2017/05/EnergySavingsFromWindowShades\\_FinalWebReport.pdf](https://rmi.org/wp-content/uploads/2017/05/EnergySavingsFromWindowShades_FinalWebReport.pdf).

<sup>162</sup> *Id.*

<sup>163</sup> Smart alarms come in a variety of features. They could provide notice of fires, carbon monoxide, tornados, and other potential dangers; many are available from \$50–\$200. Mike Prospero, *Best Smart Home Detectors 2019*, TOM'S GUIDE (Feb. 19, 2019, 12:06 PM), <https://www.tomsguide.com/us/best-smart-smoke-detectors,review-4472.html>

<sup>164</sup> See generally U.S. FIRE ADMIN., U.S. DEP'T OF HOMELAND SEC., STATE-BY-STATE RESIDENTIAL SMOKE ALARM REQUIREMENTS (2010), [http://www.thewfsf.org/sap\\_usa\\_files/FEMA\\_StateSmokeAlarmRequirementsMay2010.pdf](http://www.thewfsf.org/sap_usa_files/FEMA_StateSmokeAlarmRequirementsMay2010.pdf) (detailing the fire alarm requirements for 47 states).

<sup>165</sup> See *supra* pp. 579–80.

standard practice of the building industry could most likely be used as an effective shield to liability.<sup>166</sup> Therefore, the building codes should modify standard practice, once the BPL framework favors adopting the new technology for average individuals. That said, it is exceptionally hard to value human life or personal belongings, and if a specific value is placed on human lives they often are valued differently based on their occupation or age. Furthermore, disasters are very difficult to predict, so identifying when a code should be implemented is often a case of letting multiple people suffer loss before being able to identify what the appropriate level of safety for all of society is. While this tends to reach an optimal level of safety, the process may be exceptionally slow due to the relatively rare nature of disastrous events. Under the BPL formula, however, once the benefits of adopting the technology are widely proven, and if any tort suit by an individual is successful in arguing that smarter fire or carbon monoxide alarm systems should have been provided, the codes should be modified to adopt this standard.

From a utilitarian perspective, the standard tort analysis would consider lost wages, the harm to a family of losing a loved one, the cost to society of fighting fires and responding to alarms, and the damage to the buildings in comparison to the cost of the smart alarms. Under this utilitarian perspective, the total cost of the disaster in comparison with the expense of installing smart alarms is the key metric for differentiation. Unfortunately, so much depends on the scale of the disaster, the uncertainty of the disaster happening, and other negative societal consequences. Since every person and building is different, different strategies in the face of disaster may be more effective. As smart alarms achieve economies of scale and approach the cost of existing technology, it seems clear that the benefits of installing this lifesaving equipment would likely exceed the cost to developers.

Under the final rationale that the codes should provide the highest reasonable living environment with the greatest level of safety, smart alarms have great potential to save human lives, and they therefore should be implemented regardless of costs. Disaster situations are also too unpredictable and variable to consider under macroeconomic frameworks, and for that reason should be based on the reasoned judgement of the legislature enacting the code. This type of monitoring works best when it is consistent and implemented by the government because inconsistencies

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<sup>166</sup> *Baraby v. Swords*, 2006-Ohio-1993, 851 N.E.2d 559, 567 (Ohio Ct. App. 2006); *Galayda v. Penman*, 399 N.E.2d 656, 659 (Ill. Ct. App. Ct. 1980); *Butler v. Wyndtree Hous. Ltd. P'ship.*, 12th Dist. Butler No. CA2011-03-056, 2012-Ohio-49, ¶ 5 (Ohio Ct. App. 2012).



could lead to individuals making poorly informed decisions like waiting out a fire when no alarm sounds. Finally, humans tend to overestimate the probability of unlikely events,<sup>167</sup> whereas legislatures can consider large quantities of data to make the best economic decision for society as a whole.

### 3. Other Considerations

The fire alarm industry is also very powerful in defining building codes. Especially with regard to large commercial buildings, the fire monitoring systems required under the codes are quite advanced, particularly in large cities. Sprinklers, voice command systems, and multiple layers of protection are often required, at great expense to the landlord.<sup>168</sup> Still, no code requires smart alarms that send notifications to tenants' cell phones, require voice activated assistants to alert residents of a fire, allow for tenants to disable them temporarily, or interact with the lights (for instance by flashing them). Any of these features would likely be cheaper to implement than most existing technology. Still, protectionist lobby groups, as well as tenants skeptical of new technology, especially those who believe the technology might incriminate them in the event of a fire, may be resistant or not savvy enough to use the technology, which could create an even more dangerous situation.

Fire standards across the country are some of the most well-known codes; virtually all tenants understand that building codes require smart placement of fire alarms. In fact, nuisance alarms outnumber actual alerts to fire and smoke; this causes people to disable the detectors or use battery life so it is not available in a fire.<sup>169</sup> Thus, systems that allow residents to turn off the detectors on their smart phone after ensuring there is no fire, or systems that alert residents of a fire when they are away from their home, may be much more efficient at detecting and preventing fires in their early stages. Infrared detectors with pattern recognition could be instrumental in identifying early fires, even in other rooms.<sup>170</sup> That said, these alarms may be many times more expensive than existing alarms, so the requirement to install a detector in every room, regardless of its

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<sup>167</sup> See *supra* notes 115–116 and accompanying text.

<sup>168</sup> See, e.g., *MacLaurin v. City of Holyoke*, 56 N.E.3d 1254, 1256 (Mass. 2016) (finding that a building had to install an advanced fire sprinkler system despite the cost).

<sup>169</sup> AHRENS, *supra* note 39, at 17–19.

<sup>170</sup> R.J. (BRUCE) WARMACK ET AL., U.S. FIRE ADMIN., U.S. DEP'T OF HOMELAND SEC., HOME SMOKE ALARMS: A TECHNOLOGY ROADMAP 20 (2012), <https://www.cpsc.gov/s3fs-public/homesmokealarm.pdf>.

monitoring capacity, would make placing these devices in a home cost prohibitive and excessively safe.

## VI. CONCLUSION

Building codes should be expanded to require smart home technology because the benefits of these technologies are not unlike the benefits provided by other items required in the codes. The codes protect tenants from unscrupulous landlords, but as smart home technology figures more prominently in daily life, it is unlikely that all landlords will install this beneficial technology on their own. However, requiring such technology can also benefit landlords by creating an industry standard and ensuring that the economic incentives for providing high-quality living environments are aligned. A variety of positions reflecting tort, utilitarian/economic, or best practice analysis can be taken regarding when and how the codes should be determined. Analyzing various technologies under each of these positions informs decisions about when the building codes should require smart home technologies and presents possible complications for implementing them. Ultimately, it is questionable whether the real estate industry will adopt the codes, given that smart home technology is still considered a luxury product. Therefore, it is important to draw attention to the fact that smart home technologies are poised to more efficiently provide many of the same benefits that the codes already require, and should therefore be incorporated into the codes.