



# Liability for Home IoT

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## Executive Summary

The emergence of the Internet of Things (IoT) is posing significant challenges to the existing product liability framework. Unlike previous liability regimes for “dumb” products, where faults for product failure can clearly percolate up the chain of distribution, it is more difficult to hold retailers, mid-channel distributors, and manufacturers liable for the damages caused by “smart” devices. This difficulty arises because unlike traditional products, IoT devices come with End-user License Agreements (EULAs) and other types of software contracts which allow manufacturers to disclaim most, if not all, liability for damages incurred by the usage of IoT products.

Although software licenses protect IoT manufacturers from prohibitively costly litigations, they significantly limit consumer rights. These EULAs make it hard for people to claim compensations when products do fail, since the terms of service disclaim such liability. IoT device failure can lead to a range of damages, from the direct damages of a device simply breaking, to extreme cases, where product failures indirectly lead to consumer injuries and death. Product liability could help compensate consumers for such damages when caused by dumb products, but IoT EULAs effectively do away with this product liability.

EULAs are contracts that consumers must accept in order to use IoT products. Like any other legal contract, a EULA is only invalid if it violates positive law<sup>1</sup> or is unconscionable. Since almost all courts have implicitly accepted the legality of EULAs for software, consumers can only viably hold producers liable for damages they receive from an IoT device by showing that a software license is unconscionable. Proving that a EULA is unconscionable is however a very difficult task. Because there is no federal liability framework, unconscionability is determined on a case-by-case and state-by-state basis.

As IoT devices become an important part of people’s homes, we strongly recommend that the government work with industry, consumer advocacy groups, and other experts to establish a federal framework for determining reasonable limits to IoT software license agreements. Additionally, we propose that interested stakeholders use the concept of an unconscionability space to reach a consensus on what is unconscionable for different IoT products.

To help conceptualize this space, we first provide a brief history of the Internet of Things. Next, we explore the existing liability framework and the economic benefits of product liability. Here we show that by providing a legal avenue for consumers to obtain financial compensations for injuries caused by faulty appliances, product liability incentivizes companies to produce safer

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<sup>1</sup> Statutes that have been laid down by a legislature, court, or other human institution and which can take whatever form the authors want. For example, an agreement in which you sign yourself into slavery would be a violation of existing positive laws.

products. We also discuss how the software licenses of IoT devices complicate the existing liability framework.

We proceed to clarify the concept of unconscionability and explain our unconscionability space proposal. Here we differentiate between procedural unconscionability, which deals with the conditions under which the contract was made, and substantive unconscionability, which covers the actual terms of the contract. Our unconscionability space measures procedural and substantive unconscionability in a plane. In order to prove that a contract is unconscionable, we recommend using this space to show that it is sufficiently both procedurally and substantively unconscionable.

The next section uses this newly defined unconscionability space to examine four different types of home IoT products: smoke detectors, light bulbs, refrigerators, and game consoles. We posit that, due to its high procedural and substantive unconscionability, smoke detectors EULAs as they currently stand are unconscionable. Contrarily, we believe that the terms of services for gaming consoles are not unconscionable, as they are low on both procedural and substantive unconscionability. Whether or not the software license agreements of light bulbs and refrigerators are unconscionable is less certain. The unconscionability of these contracts is up for debate since the terms of service for the former contains high procedural, but low substantive unconscionability, while the EULAs of the latter contain high substantive, but low procedural unconscionability.

After placing these four case studies on our unconscionability space and demonstrating the space's utility, we then recommend that the FTC use it to develop a liability framework similar to a body of common law. By holding regular forums and workshops that bring together industry, consumer advocacy groups, regulators, and other experts, the FTC could facilitate the development of guidelines for creating reasonable EULAs for various IoT products in a way that best satisfies all stakeholders. In doing so, they could potentially create a liability balance that fosters both fairness and safety without compromising innovation.

## The Problem

The existing liability framework works relatively well to protect consumers from household appliance defects. Under the current legal landscape, consumers can hold manufacturers accountable for any damages incurred from using faulty products. If a user's oven has a defect that makes it catch on fire tomorrow, for example, they could bring a liability suit against the manufacturer and reasonably expect a favorable outcome. Overall, consumers can be reasonably confident that they are protected against injuries caused by many current household appliances.

New Internet-connected household products, however, threaten to undermine product liability protections. Almost all of these devices have restrictive software license agreements that disclaim all liability. Under these agreements, if a malicious user compromise one's Internet-connected oven to start a fire or hack one's Internet-connected washing machine to ruin their clothes, the consumer would have no recourse for compensation. While manufacturers have some need to limit their product liabilities, the breadth and ubiquity of these disclaimers could effectively put an end to product liability as Internet-connected products replace their traditional counterparts.

## Introducing the Internet of Things

The term Internet of Things, or IoT, has received a lot of positive media attention in recent years. The IoT revolution has often been portrayed by news outlet and corporations as a transformative force that will usher in world-changing innovations and unprecedented growth. Cisco, for instance, believes that the the world will hit 24 billion Internet-connected devices before 2020, or about 3 for every person in the world.<sup>2</sup> Morgan Stanley projects even greater growth, with an upper bound of 75 billion devices in 2020.<sup>3</sup> Huawei reaches out a bit further into the future, predicting a full 100 billion devices connected to the Internet by 2025.<sup>4</sup> These staggering projections of the rapid adoption of the Internet of Things are accompanied by grand estimates of extraordinary economic growth. According to the McKinsey Global Institute, the proliferation of IoT devices will have an economic impact of "\$3.9 trillion - \$11.1 trillion per year in 2025."<sup>5</sup>

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<sup>2</sup> Cisco, "Cloud and Mobile Network Traffic Forecast - VNI."

<sup>3</sup> Danova, "Morgan Stanley."

<sup>4</sup> Huawei, "Global Connectivity Index 2015."

<sup>5</sup> Manyika et al., "Unlocking the Potential of the Internet of Thing"

The Internet of Things offers a potential economic impact of \$4 trillion to \$11 trillion a year in 2025.



Figure 1: IoT Statistics

For all these high expectations, the term IoT has not been well defined. For the purposes of this paper, we use Internet of Things to refer to objects with embedded network connectivity and/or computing capabilities. For these devices to be “smart,” they must also generate, send, and receive data with minimal human interactions. While other definitions are slightly different—they sometimes emphasize, among other things, tight power or computational constraints, interoperability, or autonomy—our definition fits the prevailing notions of the Internet of Things well enough for the purposes of this paper.<sup>6</sup>

### Potential Benefits

Connecting otherwise ordinary devices to the Internet allows for several types of benefits. Interconnectivity can facilitate better

coordination among different devices which, in turn, can reduce operational costs, maximize productivity, and create more opportunities to innovate. Factories, for example, can use smart sensors and digital control systems to automate their manufacturing processes so that they can efficiently respond to fluctuating demands without incurring more operational overheads. Similarly, smart appliances in our homes can help maximize productivity by allowing us to automate and coordinate menial tasks that otherwise require hours of manual labor. Using IoT devices also opens up new avenues for innovation. Unlike traditional computation, which can only gather information from one’s phone, tablet, or computer, IoT devices can theoretically collect information on everything. The data collected by IoT devices, in turn, can fuel further innovation. Combined with new machine learning techniques, this data can be used to improve self-driving cars, better diagnose health issues, save the environment, and provide other benefits that we cannot yet imagine.<sup>7</sup>

### Potential Risks

As with any new technology though, IoT devices in the home introduce a variety of risks. It is now common knowledge that almost any software connected to the Internet can be compromised, and evidence shows that IoT software is no exception.<sup>8</sup> For example, researchers

<sup>6</sup> Internet Society, “The Internet of Things: An Overview.”

<sup>7</sup> Ibid.

<sup>8</sup> Many hacks of IoT devices have already been published. Justin Brookman, in his testimony before Senate Commerce on the Internet of Things, pointed out that hackers have successfully attacked smart kitchen appliances, TV’s, baby monitors, home alarms, toilets, and more. (Brookman, “Testimony.”)

from Columbia University have demonstrated a printer vulnerability that could be exploited to physically destroy the device.<sup>9</sup> This increased susceptibility of IoT devices to malicious attacks in turn raises the thorny question of liability: who should pay for damages incurred by defective smart devices?

For “dumb” appliances—products that are not part of the Internet of Things—victims can seek compensation for losses through product liability suits and insurance claims. In the case of non-IoT printers, a consumer might be able to sue for and receive some compensations if their printer suddenly stopped working. Software, however, operates under different dynamics. Instead of owning the software outright, consumers are only licensed to use the product. These licenses, which are often called End-user License Agreements (EULAs), define the contractual obligations between the two parties and can often shield the programmers against all product liability.<sup>10</sup> Since some of these EULAs also disclaim hardware failures, the users might not be able to claim compensations for damages incurred.<sup>11</sup> If this type of liability disclaimer becomes an established norm for IoT device, then these licenses could effectively spell the end of product liability if IoT devices become ubiquitous.

## License Agreements: The Importance of Product Liability

Even if these projections of the impact of the Internet of Things turn out to be outlandish, we still cannot dismiss the increasing role that IoT will play in our society. The Internet of Things is not science fiction—the ever decreasing costs of computational power and network connectivity are bringing many IoT products to market now. We are constantly surrounded by IoT devices like the Apple Watch,<sup>12</sup> Nest home appliances,<sup>13</sup> Samsung Smart TV’s,<sup>14</sup> 4G-connected Chevy cars,<sup>15</sup> and more. The number of devices available now, however, pales in comparison to the devices, platforms, and architectures that are right around the corner. Many major corporations and organizations have their own vision of what the future of IoT should look like,<sup>16</sup> and are racing to bring their visions to market before they are shut out by their competitors.

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<sup>9</sup> Piesing, “Hacking Attacks on Printers Still Not Being Taken Seriously.”

<sup>10</sup> For an example of an early court case upholding the legality of EULAs (formerly known as shrink-wrap licenses), see *ProCD Inc. v. Zeidenberg* (United States Court of Appeals for the Seventh Circuit 1996).

<sup>11</sup> See Nest’s EULA for an example of incorporating hardware disclaimers into software EULAs.

<sup>12</sup> Apple, “Apple Watch.”

<sup>13</sup> Nest, “Nest.”

<sup>14</sup> Samsung, “Samsung Smart TV - TV Has Never Been This Smart.”

<sup>15</sup> Chevrolet, “4G LTE.”

<sup>16</sup> For instance, look at Intel’s all-encompassing “IoT Platform”, “The Internet of Things (IoT) Starts with Intel Inside.” Besides major corporations, you have alliances like the AllSeen Alliance, which is organized by the Linux Foundation, working to create open-source architectures like AllJoyn (AllSeen Alliance, “Allseen Alliance.”) Each of these architectures have varying degrees of interoperability. For instance, Amazon’s AWS IoT (Amazon Web Services, “AWS IoT.”) might potentially work well with aspects of Intel’s IoT Platform, but probably would not play as nicely with the AllJoyn platform.

Although these proposed devices, platforms, and architectures have not yet resulted in tangible growth for the IoT market, we must not discount the future potential of the IoT. Indeed, the impact of the IoT could follow the growth trajectory for Bluetooth and increase exponentially. According to McKinsey & Company, “throughout the late 1990s and early 2000s..., there was much discussion in the semiconductor industry about the potential benefits and implications of Bluetooth technology... [The] inflection point for Bluetooth,” however, “did not happen until 2003 or 2004, when a large enough number of industry players adopted it as a standard and pushed new Bluetooth-based devices and applications into the market.”<sup>17</sup> Thus, despite the hazy future for IoT, there is currently enough growth to warrant a closer analysis of this potentially disruptive phenomenon. In this paper, we will focus on the impact of the proliferation of IoT devices in people’s homes on product liability.

### Understanding Product Liability

There are actually two meanings of “product liability” that vastly differ in scope. The more narrow of the two, which emerged in the 1960’s and 1970’s, refers to defect-based tort cause of action. Under this tort, a commercial seller can be held liable for selling a product with a dangerous defect. The broader definition loosens the defect-based constraint and includes any ground on which a seller might be held liable for the injuries that its product causes.<sup>18</sup> In our analysis, references to product liability will encompass the broader definition unless clarified otherwise.

Product liability refers to the area of law where manufacturers and retailers are held responsible for the damages caused by their product’s failures. Under the existing liability regime, product liability claims fall into three categories: negligence, strict liability, and breach of warranty, as summarized by Table 1. Negligence-based liability makes a product manufacturer responsible for damages if they created defective products because they did not exercise “the level of care that someone of ordinary prudence would have exercised under the same circumstances.”<sup>19</sup> Strict liability, on the other hand, holds corporations responsible for the damages caused by their products, regardless of culpability. To be held strictly liable for damages, a producer’s product must have manufacturing defects that proximately caused<sup>20</sup> the damages, and the producer must have failed to warn the user of the potential for damages. Finally, breach of warranty cases are those that involve the manufacturers violating the implicit or expressed warranties of a product.<sup>21</sup>

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<sup>17</sup> McKinsey & Company, “The Internet of Things.”

<sup>18</sup> For a more detailed treatment of the definition of products liability, as well as the history of its development, see Goldberg and Zipursky, “Easy Case for Products Liability Law.”

<sup>19</sup> “Negligence.”

<sup>20</sup> “Proximate Cause.”

<sup>21</sup> Abruzzi, Interview by Bao Kham Chau, Zane Markel, and Danielle Man.



Table 1: Traditional Product Liability Summary

Product Liability	Negligence	Strict Liability	Breach of Warranty
Who is liable?	Product Manufacturer	Product Manufacturer	Product Manufacturer
Why?	Manufacturer did not exercise appropriate level of care	Product defects are proximal cause of damages	Manufacturer violates implicit or expressed product warranties

Through these three liability regimes, consumers can seek financial compensations for the damages caused by manufacturing, design, or marketing defects. However, users are often unable to completely claim compensations for harms caused by their defective products.<sup>22</sup> To justify such a claim, a consumer must be able to demonstrate that his product has a defect, a process which at times can be prohibitively difficult and poorly defined.<sup>23</sup> Additionally, in cases involving IoT devices, retailers and manufacturers can invoke the terms of software license agreements to disclaim all liability.<sup>24</sup> Thus, while filing a defective product claim is typically difficult, the effort might prove to be entirely futile when dealing with IoT devices.

Despite this shortcoming, product liability plays an important role in our society. It not only upholds our fundamental understanding of fairness, but also serves to keep products safer. Indeed, by raising the costs of selling dangerous merchandise, product liability incentivizes companies to create safer appliances. To Professor John Goldberg of Harvard Law School and Benjamin Zipursky, two experts on tort law, the case for product liability is incredibly easy:

“It holds manufacturers accountable to persons victimized by their wrongful conduct. It empowers certain injury [sic] victims to invoke the law and the apparatus of government to vindicate important interests of theirs. It instantiates notions of equality before the law and articulates and reinforces norms of responsibility. And in doing all these things, it contributes in direct and indirect ways to deterrence and provides welfare-enhancing compensation. For all these reasons and others, it is extremely valuable that courts, at the behest of victims, have the authority to order commercial sellers of defective products

<sup>22</sup> Polinsky and Shavell, “The Uneasy Case for Product Liability.”

<sup>23</sup> There are two general approaches to demonstrating a product defect. First, the “consumer expectations” test holds that a product is in a “defective condition unreasonably dangerous to a user or consumer.” However, the threshold for “unreasonably dangerous” is unclear, and many legal experts are critical of this approach. The other test, the “risk utility” test, holds a product defective when “the foreseeable risks of harm posed by a product could have been reduced by the adoption of a reasonable alternative design,” where “reasonable” is determined by a cost-benefit analysis. However, for complex products, such an analysis can easily require expertise beyond the means of a harmed user and his or her legal team. For further reference and discussion, see Vladeck, “Machines without Principals: Liability Rules and Artificial Intelligence.”

<sup>24</sup> We will examine several examples later in this paper

that cause injury to compensate their victims.”<sup>25</sup>

Product liability, however, is not the only avenue for consumers to claim compensations for damages incurred. Nor is it the only force safeguarding consumers against an influx of defective products. Insurance, for instance, can often cover most or all of the compensation for the monetary damages caused by a product. Additionally, consumer backlash against faulty merchandise can deter companies from being negligence. Finally, when market forces are inadequate, the government can enact safety regulations to protect consumer rights and force corporations to manufacture reliable appliances.<sup>26</sup>

These overlapping benefits of product liability with insurance, the market, and regulations have led some to call for an end to product liability.<sup>27</sup> According to Goldberg and Zipursky, product liability is certainly imperfect: “[liability law] is expensive and in some ways unpredictable. On occasion, judges and jurors mishandle scientific information, display insensitivity to business realities, are harsh in their judgments about victim behavior, and issue indefensible judgments about liability and damages.”<sup>28</sup> Despite these drawbacks, product liability has some irreplaceable benefits. For instance, insurance claims, unlike product liability claims, not only fail to cover non-monetary pain and suffering, but also do not offer complete coverage to everyone.<sup>29</sup>

Additionally, the effectiveness of market forces is dependent on the existence of product liability as well. Indeed, individual or large class action suits often attract enough media attention to inform consumers about the dangers potential posed by a product. Regulation is similarly intertwined with liability—either can inform the other. Both can incur unexpectedly large transaction costs, so there is no strong case that one is more cost effective than the other.<sup>30</sup> Thus, it is premature to assert that a subset of product liability, insurance, market forces, and regulation can provide adequate protections against damages caused by defective products. Instead, we maintain that, despite the existence of other mechanisms, product liability plays an indispensable role in safeguarding consumer rights.

## Software Licenses of Home IoT Devices

Software licenses of home IoT devices override existing product liability protections. Indeed, home IoT devices almost always license their software in a way that completely disclaims all

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<sup>25</sup> Goldberg and Zipursky, “Easy Case for Products Liability Law.”

<sup>26</sup> Polinsky and Shavell, “The Uneasy Case for Product Liability.”

<sup>27</sup> Ibid.

<sup>28</sup> Goldberg and Zipursky, “Easy Case for Products Liability Law.”

<sup>29</sup> In “The Uneasy case for product liability”, Polinsky and Shavell argue that tort law’s compensation for pain and suffering is actually counterproductive. However, Goldberg and Zipursky respond to this criticism in “The Easy case for products liability law.”

<sup>30</sup> Goldberg and Zipursky, “Easy Case for Products Liability Law.”

liability for failures.<sup>31</sup> To access the full functionalities of these devices, users have no choice but to agree to the terms of services. For example, Nest, a smart appliances vendor, employs a restrictive EULA that disclaim all liabilities for its product’s failures.<sup>32</sup> Nest’s software licence require that users acknowledge that they will not rely on Nest merchandise for “life-safety and critical uses,”<sup>33</sup> even though their smart smoke detector and smart security camera are designed for those very purposes. Similar to the EULAs of other IoT devices, Nest’s license are non-negotiable.<sup>34</sup>

Disclaiming all liabilities has become a disturbing norm across all types of home IoT devices, from Samsung’s Smart TV’s,<sup>35</sup> to Canary’s “complete security system,”<sup>36</sup> to Ilumi’s smartbulb, to Chillhub’s open source refrigerator.<sup>37</sup> Even though the software for all of these products falls under a wide range of license agreements and circumstances, the results are constant. All of these license agreements completely disclaim any liability and warranties, give the user no option to negotiate the contracts’ terms, and will essentially render the devices useless if the user does not agree to them. Table 2 summarizes these license agreements.

Table 2: Summary of the Software Licences for Select Home IoT Products

Product	Nest	Smart TV	Canary	Chillhub	Ilumi
License Type(s)	EULA, Terms of Service	Tizen SDK, Flora, and Apache <sup>38</sup>	EULA <sup>39</sup>	MIT License <sup>40</sup>	Terms of Sale, <sup>41</sup> iPhone app EULA <sup>42</sup>
Liability?	disclaimed	disclaimed <sup>43</sup>	disclaimed	disclaimed	disclaimed with app
Negotiation?	none	none	none	none	none

<sup>31</sup> This will be thoroughly discussed in our sections to come.

<sup>32</sup> Nest, “End User License Agreement.”

<sup>33</sup> Nest, “Terms of Service.”

<sup>34</sup> The EULAs of Nest and the rest of the products in this section will be discussed more thoroughly in our case studies, under the “Unconscionability Space” section to come.

<sup>35</sup> Samsung, “Samsung Smart TV - TV Has Never Been This Smart.”

<sup>36</sup> Canary Connect, Inc., “Canary - A Complete Security System in a Single Device.”

<sup>37</sup> “Chillhub.”

<sup>38</sup> Kim and Macierira, “Open Source Governance and Licensing for Tizen 3.0.”

<sup>39</sup> Canary Connect, Inc., “Canary End User License Agreement.”

<sup>40</sup> FirstBuild, “ChillHub License.”

<sup>41</sup> ilumi solutions, inc., “Ilumi LED Smartbulbs - TERMS OF SALE.”

<sup>42</sup> Apple, “Licensed Application End User License Agreement.”

<sup>43</sup> The Apache Software Foundation, “Apache License”; Tizen Project, “Tizen SDK License Agreement”; “Flora License.”

Useful without agreement?	no	no	no	no	N/A for Terms of Sale, no for iPhone app
Notes	no life critical services		no life critical services	all open source <sup>44</sup>	

As these examples show, IoT devices can have many different variants of limited liability contracts. Something that is consistent across all of the devices we have investigated<sup>45</sup> is the non-negotiability of software licenses and the practice of disclaiming all liability. Additionally, almost without exception, these devices are nearly useless if the user does not agree to the associated contracts. Accepting these terms of services, however, will essentially render most current liability protections ineffective. To help solve this paradox, we recommend interested parties to use our unconscionability space, as defined in the next section.

## Unconscionability Space

### License Agreements and Liability

IoT devices pose a significant challenges to the existing product liability framework. Unlike “dumb” devices, IoT products are usually embedded with software that enhances their functionality. In order to use this software however, consumers must first agree to the software’s term of services. As stated previously, these licences typically force consumers to assume all responsibility for any damages caused by the product. The Nest thermostat EULA, for example, states that:

NOTWITHSTANDING ANYTHING TO THE CONTRARY AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, NEST LABS PROVIDES THE PRODUCT SOFTWARE “AS-IS” AND DISCLAIMS ALL WARRANTIES AND CONDITIONS, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE, QUIET ENJOYMENT, ACCURACY, AND NON-INFRINGEMENT OF THIRD-PARTY RIGHTS.<sup>46</sup>

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<sup>44</sup> It makes some intuitive sense that open source products disclaim liability; it would be infeasible to hold every contributor to an open source project liable for damages, and the threat of liability could potentially prevent people from volunteering. IoT liability solutions will probably need to account for the type of organization that producing software for a given IoT device.

<sup>45</sup> These examples are not cherry picked; they are representative of all the IoT products that we investigated and generally of the variety of home IoT products that exist today.

<sup>46</sup> Nest, “End User License Agreement.”

When users accept this EULA, they enter into a contract with Nest where they effectively relinquish their rights to sue the company for any damages caused by its smart thermostat, whether for direct damages resulting from dysfunctional device software or for indirect damages resulting from dysfunctional Nest behavior.

There have been several cases filed against Nest for thermostat malfunctions. Notably, in the ongoing case of *Darisse v. Nest Labs, Inc.*, Justin Darisse is suing Nest for falsely promoting the Nest Learning Thermostat as “an easy-to-use, self-programming device that ‘saves energy’ and decreases utility bills.”<sup>47</sup> In this class action lawsuit, Darisse is seeking financial compensations for Nest’s 1) alleged breach of express and implied warranty, 2) breach of the implied warranty of merchantability, and 3) violations of California’s false advertising law. These liabilities are however explicitly disclaimed in Nest’s EULA, which Darisse accepted in order to use Nest’s product. Thus, Nest can technically invoke “the doctrines of waiver, unjust enrichment, and/or estoppel” to ask for the dismissal of the case.<sup>48</sup> Whether the judges of the California Northern District Court will rule in favor of the plaintiff or the defendant remains to be seen. Ultimately, the verdict will likely rest on whether or not the court upholds Nest’s EULA.

### Contract Law and EULAs

Contracts are legally binding agreements between two parties wherein each party consents to relinquish some rights (possibly in the form of an obligation to take or refrain from taking a certain action) in order to benefit from the consideration of the contract. Being a consensual agreement between two parties, contracts are almost always upheld in court.<sup>49</sup> Indeed, a contract is invalid if and only if it violates a rule of positive law or if it is unconscionable.<sup>50</sup>

Unlike a “natural law”, which is derived from inherent rights and can be superseded by a contract, a contract cannot violate positive law.<sup>51</sup> Thus, a contract is usually ruled invalid if it is deemed to be unconscionable. However, since there is no uniform standard to determine whether or not a contract is unconscionable, this must be done on a case-by-case basis. A contract is unconscionable if it is too unreasonable, which can be measured both procedurally and substantively. As defined in Section 2-302 of the Uniform Commercial Code, procedural unconscionability results from an unfair negotiation process. For example, it would be highly procedurally unconscionable if someone used a loaded gun to force the other person to sign a contract. Substantive unconscionability, on the other hands, occurs when a contract is

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<sup>47</sup> *Darisse v. Nest Labs, Inc.* (California Northern District Court 2015).

<sup>48</sup> See Nest’s answers to the plaintiff’s amended complaint (Doc 33) in *Darisse v. Nest Labs, Inc.* (California Northern District Court 2015). In this response, Nest asserted that “the claims are barred in whole or in part by the doctrines of waiver, unjust enrichment, and/or estoppel.”

<sup>49</sup> Abruzzi, Interview by Bao Kham Chau, Zane Markel, and Danielle Man.

<sup>50</sup> A positive law is human-made legislation that mandates or bans certain behavior.

<sup>51</sup> For instance, a contract requiring one party to give the other party heroin would be invalid, because possession of heroin violates positive law.

“unreasonably favorable” to one party.<sup>52</sup> Both procedural and substantive unconscionability, however, fall on a spectrum; there is no binary boundary between not unconscionable and unconscionable for either factor. Therefore, a contract is only unconscionable overall if the court deems a contract sufficiently unconscionable between the two factors overall.

As EULAs and other software license agreements are a type of contract, their unconscionability is also subject to the same constraints. Currently, even when EULAs disclaim all liability, they are not violating positive law. Additionally, since software licenses have used the same liability-disclaiming boilerplate text for so long, this norm is now tacitly accepted and not seen as being too unconscionable.<sup>53</sup> Ultimately, even though many EULAs are non-negotiable and thus have high procedural unconscionability, their terms are usually not substantively unconscionable enough for courts to deem them wholly unconscionable. Therefore, most of these contracts are usually upheld.<sup>54</sup>

Software, however, is currently unique among household consumer products in that liability-disclaiming licenses have become the norm. This can be understood logically from the corporation’s point of view. Since most software is ridden with bugs, a company can expose themselves to prohibitively costly litigations if they do not disclaim all liabilities associated with their codes. Contrastingly, it would be counterproductive for a company to claim that their hardware product was faulty, as they would quickly lose the consumer’s trust.

IoT products, where software is now embedded in hardware, represent the union of these two worlds. In this case, it would still be detrimental for IoT product manufacturers to claim infallible code. However, software failures can also cause complete hardware/product failures in IoT devices. It is thus logical for companies to disclaim liability for these failures in their IoT device EULAs, and this is becoming the norm. The problem is that the consequences of IoT product failures can be quite severe, yet all the responsibility is left to the consumer.

### Unconscionability for the Internet of Things

Currently, there is no clear federal framework or norm for determining procedural and substantive unconscionability for IoT devices. Additionally, there is no method for differentiating the overall unconscionability from the procedural and substantive unconscionability lenses. Thus, a clear threshold for determining whether or not license agreements are unconscionable is still undefined.

We anticipate that corporations will advocate for the acceptance of high procedural and substantive unconscionability in license agreements, because it would be costly for them to pay for all the harm caused directly or indirectly by the software of their products. Consumers, on the

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<sup>52</sup> See *ProCD Inc. v. Zeidenberg* (United States Court of Appeals for the Seventh Circuit 1996), which upheld the enforceability of a shrinkwrap license, which was the equivalent of the modern EULA or software license.

<sup>53</sup> *Ibid.*

<sup>54</sup> Abruzzi, Interview by Bao Kham Chau, Zane Markel, and Danielle Man.

other hand, have an interest in lower procedural and substantive thresholds for the unconscionability, as they would rationally seek as much protection as possible. If all parties are able to negotiate fairly, they might settle on some reasonable medium amount of unconscionability tolerance.

## Unconscionability Space

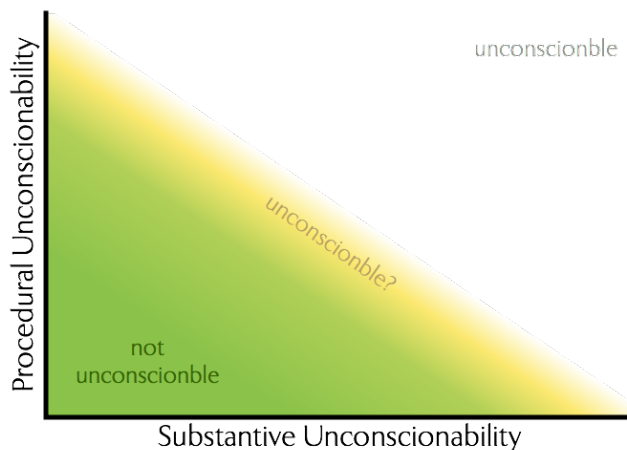


Figure 2: Basic Unconscionability Space

To help conceptualize varying degrees of unconscionability, we propose an unconscionability space concept. This space is made up of two dimensions: procedural unconscionability (arbitrarily set to the vertical axis) and substantive unconscionability (the horizontal axis). The origin signifies zero unconscionability from either dimension, essentially representing a no-contract situation. Procedural unconscionability increases along the vertical axis. The higher a EULA is along the y-axis, the less negotiation it allows. When license agreements are non-negotiable and considered accepted upon a consumer's usage of the product, they are regarded to have the highest procedural unconscionability in our space.<sup>55</sup> Substantive unconscionability, for our purposes, increases with the amount of risk taken on by the user. In other words, substantive unconscionability increases both with how much damage a device is expected to cause and how much of that damage is disclaimed by the manufacturer and put on the user. The further down the x-axis a EULA is, the more risk is put on the user. From the structure of this space, it follows that the farther away that a product's license agreement is from the origin, the more unconscionable it is.

For now, it may be easier to imagine the unconscionability space as a 2x2 grid of high and low unconscionability for both dimensions. In actuality, both dimensions exist on a spectrum, but

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<sup>55</sup> Theoretically, you could have even higher procedural unconscionability with absurd terms like "the users agrees to these terms simply by being alive," but courts would not even take such contracts seriously.

there is no existing framework for placing the license agreements for various IoT devices along these dimensions with any degree of precision. Ideally, some qualified actors will use the unconscionability space to design a framework for placing a given software license agreement in this space. With this framework in place, organizations could proceed to negotiate the boundaries of unconscionability on this space, which would help to determine whether a given license agreement is enforceable.<sup>56</sup>

Before discussing which actors and organizations are best positioned to construct these frameworks from the unconscionability space, we will ground the concept of the space in four case studies.

## Case Studies

To populate our proposed unconscionability space, we provide four case studies of basic products that one would find in the average American home: smoke detectors, light bulbs, refrigerators, and a home entertainment system. For each of these products, we compare the user licence agreements and liability that one would find in the “dumb” device and in its “smart” device counterpart. Specifically, we look at the procedural and substantive unconscionability in the license agreements, and how liability protections change between the dumb and smart devices.

### Smoke Detectors

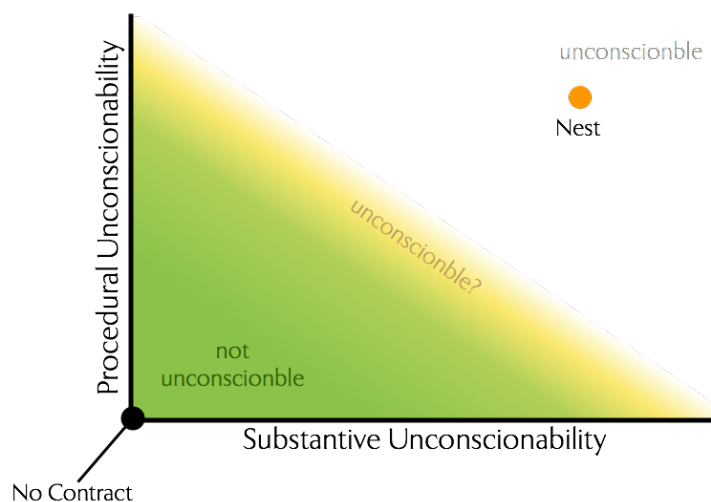


Figure 3: Nest EULA in the Unconscionability Space

We chose to investigate smoke detectors because their use increases a homeowner’s feeling of safety in his or her home, and consumers count on their smoke detectors to reliably warn them of

<sup>56</sup> In our figure, we represent the possible space for that boundary by the yellow gradient, bearing in mind that there is a wide range of boundaries that could eventually result.



a fire emergency. Nest Protect smoke detector was specifically chosen because the company's products are the quintessential example of home-based Internet of Things devices. They are among the first smart home products to be widely popularized and distributed. Additionally, Nest products are also the first IoT devices whose failure could cause critical harm to a home: the failure of a smart lightbulb to turn on would inconvenience a consumer, but the failure of Nest's smart fire detector to detect or alert home occupants of a fire could cause severe injury, devastating property damage, or even death.

In Massachusetts it is required that all homes have smoke detectors: "all one and two family dwellings that provide living and sleeping ... occupied in whole or in part for residential purposes ... shall be equipped with approved working smoke alarms or detectors".<sup>57</sup> That said, Nest disclaims all software liability and explicitly does not guarantee proper functionality when it comes to life-safety or use of their devices for "critical uses".<sup>58</sup>

The Nest Protect knows what it is sensing; it can tell the difference between burning toast and a burning toaster and adjusts its response accordingly.<sup>59</sup> This means that the product's software is integral to its functional success, and software failures will likely render the device completely inert. As mentioned before, Nest's EULA (common across all Nest products) disclaims all liability for product failures, even when the failure is resultant from known hacks and software flaws:

NEST LABS DOES NOT GUARANTEE ANY SPECIFIC RESULTS FROM THE USE OF THE PRODUCT SOFTWARE. NEST LABS MAKES NO WARRANTY THAT THE PRODUCT SOFTWARE WILL BE UNINTERRUPTED, FREE OF VIRUSES OR OTHER HARMFUL CODE, TIMELY, SECURE, OR ERROR-FREE...<sup>60</sup>

Furthermore, there is no need to speculate about a potential hack of Nest devices, because at least one has already occurred.<sup>61</sup> The Nest Protect is a certifiably safe fire alarm that can be used in your home to meet state requirements;<sup>62</sup> however, if you choose to do so, you are automatically accepting their EULA:

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<sup>57</sup> *Massachusetts Comprehensive Fire Safety Code.*

<sup>58</sup> Nest, "Terms of Service."

<sup>59</sup> Information gleaned from Nest's basic advertising (Nest Labs, "Meet Nest Protect.")

<sup>60</sup> Nest, "End User License Agreement."

<sup>61</sup> Takahashi, "Hello, Dave. I Control Your Thermostat. Google's Nest Gets Hacked."

<sup>62</sup> Nest Labs, "Nest Support."

IF YOU DO NOT AGREE TO THE TERMS OF THIS EULA, YOU MAY NOT USE THE PRODUCT SOFTWARE AND YOU MAY CHOOSE TO PROMPTLY RETURN THE PRODUCT...<sup>63</sup>

This means that if a homeowner chooses to use the Nest Protect fire detector, and it fails because of a software problem that Nest has acknowledged, the homeowner will be:

SOLELY RESPONSIBLE FOR (AND NEST LABS DISCLAIMS) ANY AND ALL LOSS, LIABILITY, OR DAMAGES... RESULTING FROM YOUR USE OF THE PRODUCT INFORMATION, PRODUCT SOFTWARE, OR PRODUCT... EVEN IF NEST LABS KNEW OR SHOULD HAVE KNOWN OF THE POSSIBILITY OF SUCH DAMAGES...<sup>64</sup>

Though the features of the Nest Protect provide numerous advantages over traditional home smoke detectors for everyday use, in the event of a device failures, Nest's EULA leaves consumers in a distinctly different and worse situation than they would have been in otherwise.

In past cases of defective smoke detectors, some courts have held manufacturers strictly liable for damages.<sup>65</sup> For a plaintiff to make a strict liability claim, he or she must show that:

1. the smoke detector is a defective product,
2. the defective product creates unreasonable risk not outweighed by the benefits
3. the defective nature of the product is the proximate cause of the plaintiff's injuries/damages.<sup>66</sup>

It is not unlikely that Nest will find themselves at the helm of similar lawsuits, as the Nest Protect is not infallible. In mid-2014, Nest recalled almost half a million Nest Protects due to the possibility of a "complete failure to sound an alert when triggered by an actual fire or CO2 threat."<sup>67</sup>

While these criteria and the ability to create a strict liability and negligence claims can classically protect homeowners from faulty smoke detectors, they cannot protect homeowners from a faulty Nest Protect. Consumers automatically agree to Nest's EULA by installing a Nest Protect, thus giving up their right to claim damages from Nest in the event of a device failure. One could try to take Nest to court for damages ensuing from a failure in a Nest Protect; however, one would have agreed to Nest's EULA—therefore relinquishing the right to claim damages—by simply

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<sup>63</sup> Nest, "End User License Agreement."

<sup>64</sup> *ibid.*

<sup>65</sup> For example, see *Mercer v. Pittway Corp.* (Supreme Court of Iowa 2000).

<sup>66</sup> Again, see *Mercer v. Pittway Corp.* (Supreme Court of Iowa 2000) for a full discussion.

<sup>67</sup> Altavilla, "When The IOT Fails."

using their product. Thus, one would have to demonstrate that the Nest Protect EULA is unconscionable before even having a chance to request compensation for damages.

The Nest Protect falls in the top right corner of our unconscionability space, as it rates high in both procedural and substantive unconscionability (See Figure 3). Nest’s products are procedurally unconscionable because one agrees to the EULA by simply using the product—it is likely that most consumers of Nest’s products do not know that the EULA exists at all. Nest’s products are also highly substantively unconscionable because they disclaim all liability for product software failures yet could potentially cause a great deal of great harm.

## Light bulbs

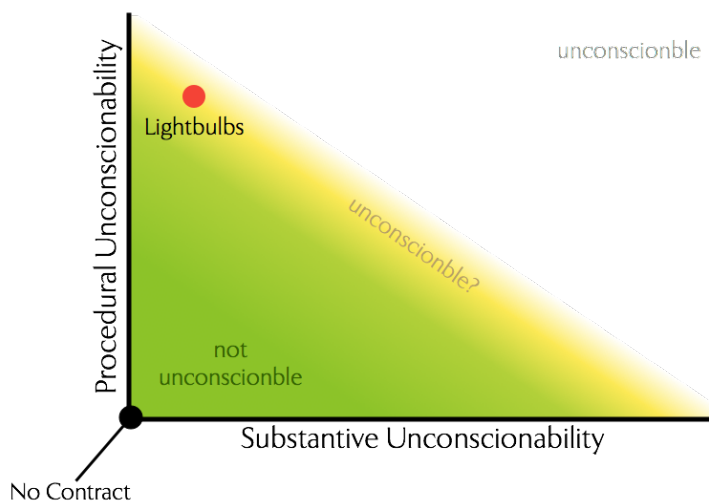


Figure 4: Smart Lightbulb EULAs in the Unconscionability Space

Light bulbs are representative of the high procedural and low substantive unconscionability group. When consumers use traditional light bulbs, they automatically enter into a contractual agreement with the light bulbs’ manufacturers. Although this automatic acceptance of the manufacturer’s terms of service is procedurally unconscionable, the manufacturer’s acceptance of some limited liability for product malfunctions renders the contract less substantively unconscionable. General Electric (GE), for example, provides limited warranties for their light bulbs and assumes some responsibilities for product defects. In the case of a GE UltraMax General light bulb malfunction, GE states that if the light bulb “fails due to defects in materials or workmanship within either (i) five (5) years after the date of manufacture in applications where maximum case temperature is < 70 degree C, or (ii) three (3) years after the date of manufacture in applications where maximum case temperature is between 70 degree C to 90 degree C, then GE will” compensate the consumer for damages caused by the product defects.<sup>68</sup>

<sup>68</sup> GE Lighting, “T8 Fluorescent UltraMax.”

Unlike traditional light bulbs, smart light bulbs utilize Internet connectivity to provide additional functionalities. Ilumi and LiFX light bulbs, for example, allow the users to use apps to adjust their color and brightness and “experience lighting like never before.”<sup>69</sup> Additionally, LiFX light bulbs can integrate with other IoT devices, such as the Amazon Echo, to provide alternative avenues to control one’s lighting. In order to use these additional features, the user must agree to the device’s EULA which, like the Nest Protect EULA, disclaims all liabilities resulting from the product’s software. In LiFX’s EULA, for example, the company states that:

THE LIFX SERVICE IS PROVIDED "AS IS" AND "AS AVAILABLE". LIFX AND ITS SUBSIDIARIES, AFFILIATES, PARTNERS, LICENSORS AND SUPPLIERS HEREBY EXPRESSLY DISCLAIM ANY REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, ... IN NO EVENT SHALL LIFX... BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL OR OTHER DAMAGES<sup>70</sup>

LiFX’s denial of all liabilities stands in stark contrast with traditional light bulbs’ terms of service, which accept limited liability for product malfunctions. Despite this, IoT light bulbs have more points of failure and can cause more damage than traditional light bulbs. For instance, LiFX light bulbs could serve as an entryway through which a hacker could pivot to more valuable targets. Additionally, a malicious user might obtain private usage data to determine the user’s daily schedule, which could be used to facilitate a burglary. By both disclaiming greater liability and imparting greater risks on users, LiFX’s EULA has greater substantive unconscionability than traditional light bulbs.

At the same time, LiFX EULA applies the same highly procedurally unconscionable terms of agreement that traditional light bulbs use with their terms of service—the user agrees to it simply by using the light bulb. Thus, LiFX smart bulbs fall vertically high and somewhat to the right of the origin on the unconscionability space. It is unclear whether or not this EULA should be deemed unconscionable. Regardless, it should be somewhat near the threshold of unconscionability. As we will discuss more in a further section, stakeholders will ultimately negotiate the details of the threshold’s placement and shape.

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<sup>69</sup> ilumi solutions, inc., “Press Kit.”

<sup>70</sup> LiFi Labs, Inc., “Legals.”

## Home Appliances (Fridge)

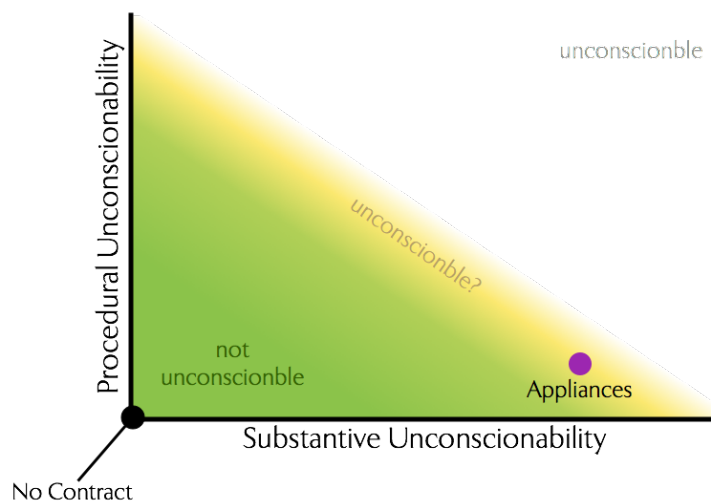


Figure 5: Smart Fridge EULAs in the Unconscionability Space

Smart fridges are representative of the larger category of IoT Home Appliances, which also includes products like washing machines and dishwashers. Though smart fridges have not yet been widely advertised and brought to market, they do exist.<sup>71</sup> The Whirlpool<sup>72</sup> smart fridge, for example, knows when your power goes out, and can “manage your drinking water and control the power settings, even when you’re away.”<sup>73</sup> The Chillhub<sup>74</sup> smart fridge has a USB port and wifi connection, and is a collaborative open source project.

These appliances fall high on the substantive unconscionability spectrum, but low on the procedural unconscionability spectrum, putting them in the bottom right corner of our unconscionability space. Chillhub and Whirlpool are highly substantively unconscionable because, like Nest, they disclaim all liability for potentially large damages. Since Chillhub’s fridge software is open source,<sup>75</sup> it operates under the MIT license, which disallows users who have suffered damage to make a claim:

THIS SOFTWARE IS PROVIDED “AS IS”, WITHOUT WARRANTY OF ANY KIND... IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES, OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF

<sup>71</sup> Oliveira, “The Latest for the Tech-Obsessed Homeowner.”

<sup>72</sup> Whirlpool, “Smart Appliances.”

<sup>73</sup> Whirlpool, “Refrigerators.”

<sup>74</sup> “Chillhub.”

<sup>75</sup> FirstBuild, “Chillhub-Firmware.”

OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER OTHER DEALINGS IN THE SOFTWARE.

Whirlpool uses the same terms of service for all of its smart appliances, and these terms of service similarly disclaim all warranties and liability.<sup>76</sup> This means that if your fridge is crippled by a failure in its “smart” technology, consumers can potentially be left with thousands of dollars of damage and with no chance make a claim for compensation.

Smart home appliances have low procedural unconscionability because they are not small, insubstantial products that one can install in one’s own home. Installing home appliances is significantly more involved than screwing in a lightbulb because of their sheer size, and because they typically need to be hooked into a house’s gas or water lines. Home appliances also come with substantial installation guides and manuals, meaning that it is unreasonable for a user to be unaware of user agreements associated with the products.

Between their high substantive unconscionability and low procedural unconscionability, it is unclear whether or not courts should uphold these home appliance license agreements. Although they fall into the opposite corner of the unconscionability space as LiFX light bulbs, they are also probably near where the threshold of unconscionability should be. Thus, as with light bulbs, the unconscionability of these smart appliance license agreements will turn on how stakeholders define the threshold of unconscionability.

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<sup>76</sup> Whirlpool, “Whirlpool Smart Appliance Terms of Service.”

## Home Entertainment System

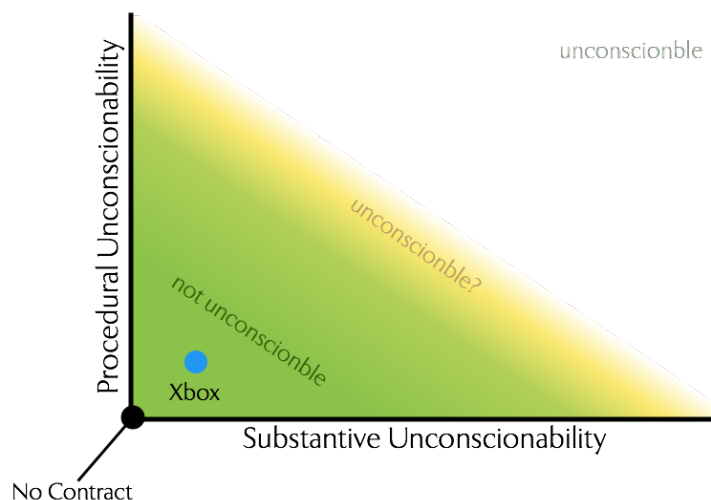


Figure 6: Xbox EULA in the Unconscionability Space

Home entertainment systems like Atari, Nintendo 64 (N64), and Sega have license agreements with low procedural and low substantive unconscionability. Although the user does enter into a contract when they use the gaming systems, the contract provisions are very liberal and the liability compensation for these systems are very generous. Nintendo 64, for example, used to offer a lifetime warranty providing repairs to defective consoles free of charge. Even for newer Nintendo consoles without Internet connectivity, the company will still repair the system for free “if a defect covered by this warranty occurs during this warranty period.”<sup>77</sup>

The transformation of home entertainment systems into IoT devices has not made their EULAs significantly more unconscionable. Despite their Internet connectivity, these gaming consoles still provide flexible terms of service and generous compensation schemes. Microsoft Xbox, for example, has two modes - online and offline. In offline mode, the Xbox is essentially a “dumb” gaming console, which is covered by the traditional hardware warranty. Under this warranty, if it has been less than 45 days from the date of purchase, Microsoft will repair most Xbox defects for free. Additionally, the consumers can negotiate for an extension of this protection by buying an extended warranty, which extends the coverage period to three years from the date of purchase.<sup>78</sup>

If the user decides to turn on the online mode, they have to agree to Microsoft’s EULAs, which, once again, disclaim almost all liabilities. According to the Microsoft Xbox terms of service,

The application is licensed "as is," "with all faults," and "as available." You bear the entire risk as to its quality and performance. Should it prove defective, you assume the

<sup>77</sup> Nintendo, “U.S. & Canada Warranty.”

<sup>78</sup> Microsoft, “Microsoft Complete for Xbox One.”

entire cost of all necessary servicing or repair. The application publisher, on behalf of itself, Microsoft, wireless carriers over whose network the application is provided, and each of our respective affiliates, vendors, agents, and suppliers ("Covered Parties"), gives no express warranties, guarantees, or conditions in relation to the application.<sup>79</sup>

The service agreement, however, is still within reasonable bounds of procedural unconscionability, as it acknowledges that the user “may have additional consumer rights under your local laws that this agreement can't change.”<sup>80</sup> Ultimately then, despite its transition from “dumb” appliances to “smart” gaming consoles, the EULAs governing these home entertainment systems fall near the origin of the unconscionability space and are still not unconscionable.

## Towards a Solution

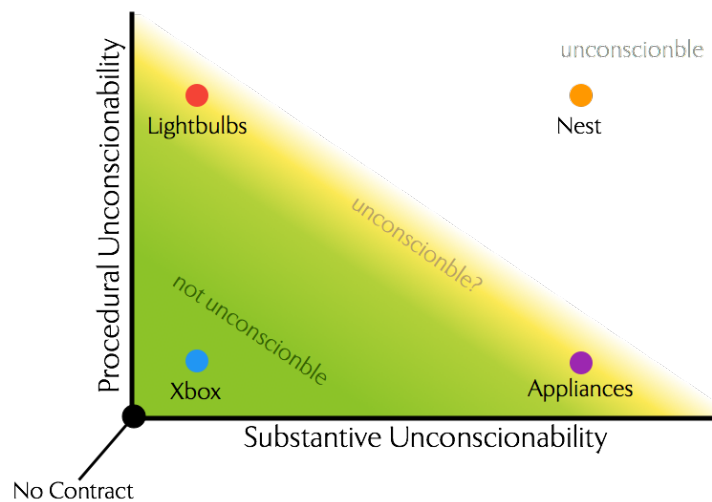


Figure 7: Unconscionability Space Populated with our Four Case Studies

As these four case studies demonstrate, there are several categories of home IoT devices. The EULAs for each of the categories we investigated fall in different regions of our unconscionability space. While we champion consumer rights, we also recognize the need for companies to disclaim some liability, lest the expected liability costs cause their products to become too unaffordable to produce. Therefore, we generally recommend that IoT EULAs have a reasonable balance between procedural and substantive unconscionability, and thus fall closer to the origin of our space.

A comprehensive framework outlining how any given IoT device should design its license agreement is beyond the scope of this paper. Even if our analysis did attempt this task, the rapid

<sup>79</sup> Microsoft, “Microsoft Services Agreement.”

<sup>80</sup> Ibid.



development of the IoT would likely render our framework obsolete in just a few years. Instead, we recommend that the unconscionability space concept serves as the foundation from which to build a coherent framework for judging IoT device license agreements. We have identified three approaches to building this framework:

1. Allow federal legislation to explicitly prescribe an unconscionability space framework. The government could update the framework whenever appropriate and politically feasible.
2. Allow the courts to analyze the unconscionability of EULAs case-by-case such that an unconscionability space framework would gradually emerge and adjust over time.
3. Empower the FTC to develop a liability framework similar to the way it has developed a body of common law for privacy.<sup>81</sup>

A legislation-based approach to IoT liability is the least likely to be successful. Legislating bodies wield the most power, but they would only be motivated insofar as companies or their constituents demand reform of EULA unconscionability. Companies could have some influence through lobbying, but this is expensive and they would only care if they start losing lawsuits; otherwise, they will likely resist any constraints on EULAs. On the other hand, experts and advocacy groups would certainly care a lot about IoT liability up front, but they would have negligible clout to influence legislations. For the experts and advocacy groups to be taken seriously, the consumers as a whole would need to mobilize. However, they would only do so if some salient crisis moved them to action. Because of these mismatches between motivation and influence, stakeholders are unlikely to successfully establish an effective unconscionability framework through the formal legislative process. Even if they could, the process would be slow and ill-equipped to keep up with technological innovations.

Another viable option is to allow an unconscionability space framework to emerge gradually from court decisions. This, however, is likely to be the least effective approach. Neither companies nor consumers would be able to anticipate how courts will rule in advance, so companies might be unsure how to design their products and EULAs appropriately, and consumers would not be equipped to make informed purchasing decisions. Experts and advocacy groups might be able to exert some influence through testimonies, but such influence would only

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<sup>81</sup> The FTC has built the a privacy framework equivalent to a body of common law. This framework grew from a few legal rules that “establish a floor” and “enforce the minimum” acceptable privacy standards. From there, the FTC has exercised section 5 of the FTC Act, which prohibits “unfair and deceptive practices,” as a justification to build a “patchwork” of regulations and norms that serve as guidelines for companies to develop their privacy policies. To do so, the FTC regularly holds workshops and forums that bring together industry, experts, academia, advocacy groups, and regulators in order to assess existing privacy practices, survey developments that affect privacy standards, and craft guidelines for designing privacy policies. While many of the results of these forums and workshops and not, strictly speaking, legal rules, companies are still expected to follow them. In practice, companies generally do follow the norms, as they enjoy participating in their development and greatly prefer them over compliance-based regulations, which would be much more cumbersome to companies. See (Solove and Hartzog, “The FTC and the New Common Law of Privacy”; Bamberger and Mulligan, “Privacy on the Books and on the Ground.”) for two thorough treatments of the FTC’s impact on privacy policy.

be able to apply to those issues that make it to court. Additionally, other governmental bodies would not find this approach palatable; we would not expect Congress to be amenable to ceding power to the judiciary. For all of these reasons, action should be taken to start establishing a full unconscionability framework before the courts are forced to do so.

The common law approach, on the other hand, could be appropriate for IoT device liability for the same reasons that it works for privacy. Namely, the FTC and other branches of the US government have realized that privacy is context-dependent; it is infeasible to divine privacy rules to cover all possible circumstances a priori. As our case studies illustrate, the same reasoning applies to IoT device liability. Under this approach, the FTC should regularly hold workshops and forums to bring together industry, experts, advocacy groups, academia, and regulators to discuss appropriate ways to examine the IoT environment and discuss what license agreements would be acceptable for the different kinds of IoT products. The existing product liability framework, combined with contract law, is already a sufficient floor for enforcing minimal liability standards. Furthermore, the FTC has already used section 5 of the FTC Act to set constraints on EULAs, ruling that EULAs were insufficient notice of hidden software that weakened privacy in surprising ways.<sup>82</sup> Thus, the FTC already has the experience and the legal power to start pursuing this approach.

If the FTC's privacy efforts are any indication, all parties attending liability workshops would be highly motivated to do so, as they would have a much larger influence over the creation of these norms than they would have otherwise. Advocacy groups would particularly enjoy the ability to engage in constructive dialogue to shape these new norms.<sup>83</sup> We thus recommend this approach to the relevant stakeholders, as it could prove beneficial for all involved.

## Conclusion

The main problem that we seek to address is that challenges to the existing product liability regime are posed by IoT device EULAs disclaiming all liability for device failures. We discussed the Internet of Things, analyzed product liability, and proposed an unconscionability space which one can use to visualize EULA unconscionability for IoT devices. To help better understand this space, we populated it with four case studies that are representative of home products as a whole. Lastly, we proposed three approaches that the government could take to preemptively solve this IoT device liability problem.

In comparing the outlook of the three proposed approaches, we believe that an FTC-led effort to build a common-law-equivalent liability framework will best structure stakeholder motivations and influence to establish an effective unconscionability space framework for IoT devices. Thus, we recommend that the FTC start holding forums and workshops with industry, advocacy

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<sup>82</sup> Bamberger and Mulligan, "Privacy on the Books and on the Ground."

<sup>83</sup> *ibid.*

groups, and other experts as soon as possible. In doing so, we may be able to save product liability law from being rendered ineffective.

More importantly though, our proposed unconscionability space will be a good cornerstone for whichever path the government takes to pursue this problem. Our space gives any of the three approaches a starting point from which they can build a complete liability framework to determine whether or not license agreements are acceptable for various products. As mentioned before, proposing an entire framework is outside the scope of this paper, as there is still too much uncertainty in the field. The idea of an unconscionability space though gives stakeholders in the IoT a reference point to discuss EULA unconscionability and acceptable degrees of liability limitation. Our unconscionability space is an important building block towards creating a uniform federal framework that will address the gap in IoT product liability which currently exists today.

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## Author Contributions

All authors contributed extensively to the work presented in this paper. Z.M. primarily contributed to the discussions on IoT history, contract law, our proposed solution section, and our citations. B.K.C. worked on the discussions of traditional product liability, the unconscionability space, the case studies on Xbox and lightbulbs, the paper's restructuring, and the "voice" of the paper. D.M. primarily contributed to the case studies on Nest and home appliances, wrote the conclusion, executive summary, and created the tables and figures presented.