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ARTICLE

Removing the Human from Trademark Law

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Abstract This paper envisions a future in which humans begin to entrust interconnected and intelligent devices and machines with the power to make purchasing decisions on their behalf. Artificial Intelligence (AI), together with the Internet of Things (IoT) and blockchain technology, will likely make this possible. What might be the role of trademarks and the law governing their protection in such a future? This paper responds to this question by considering how the use of AI, IoT, and blockchain technology in the retail space will impact the foundational concepts underpinning trademark law. The discussion highlights the difficulty of shifting trademark law away from its human-centric focus, where core doctrines and principles revolve around human interaction and perceptions, towards a system capable of adapting to a future where devices and machines interact with trademarks. Perhaps the time is ripe for legislative innovation in the field of trademarks.

Keywords Trademarks · AI and automation · Evolving trademark functions · Machine-readable formats · Trademark use · Machine confusion

1 Introduction

Imagine a world driven entirely by Artificial Intelligence (AI), the Internet of Things (IoT), and blockchain technology, in which devices speak to each other securely and make meaningful decisions, offering the convenience and efficiency needed for the

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human mind to be put to use for things that truly matter. Such a world might still sound imaginative, if not even fictional. But considering the trajectory of technological development, it is fast becoming a reality. We are already witnessing AI being incorporated into the retail consumer space. Google's search algorithm uses AI to provide internet users with the most relevant search results. Amazon's Alexa uses AI voice recognition technology to help humans interact and transact on the Amazon platform. Autonomous vehicles, like the Tesla, can run self-diagnostic tools and pre-order replacement parts, with nearly all aspects of the transaction, such as product selection and payment, being carried out using automated means without the involvement of humans. Scale this up a notch, and we might find entire homes, offices, and organizations in a wide range of industries – from healthcare to hospitality and beyond – delegating the task of managing supplies and stock to devices and machines that benefit from AI, IoT, and blockchain technology. The integration of AI into the retail consumer space poses fundamental questions about the role and relevance of trademarks in an era where algotihms, rather than humans, dictate consumer choices.

To address the emerging paradigm shaped by technological advancements, this paper introduces and examines a central hypothesis – namely, that the increasing reliance on AI and related technologies in commercial transactions is poised to challenge the traditional functions of trademarks and expose the inadequacies of core doctrines and principles underpinning trademark law. This situation creates a unique landscape of conflict and misalignment. On the one hand, trademark proprietors are increasingly leveraging technology to engage with consumers, harnessing AI and digital tools to enhance brand recognition and consumer interaction. On the other hand, concern is growing about unauthorized third parties, especially those engaging in counterfeiting, who may commit acts of infringement that do not neatly fall within the conventional confines of trademark law. These acts could range from the sophisticated misuse of AI in creating confusingly similar products or services to tampering with and altering trademark-related records stored on the blockchain, and the exploitation of digital platforms and services in a manner that traditional legal frameworks dealing with trademarks struggle to address.

This paper aims to explore these areas of potential conflict and misalignment, highlighting the aspects where existing trademark law may not fully correspond to the new realities of an AI-driven retail marketplace. Such a mismatch underscores the urgent need for a critical reassessment of trademark law. Consequently, this paper raises the following pivotal questions. What might be the role of trademarks and the law governing their protection and enforcement in a world where interconnected devices, rather than humans, make purchasing decisions? And how do these developments affect the interests of trademark owners in light of the challenges posed by the unauthorized use or misuse of technology? This paper seeks to respond to these questions by examining the historical role and functions of trademarks, the rationale and justifications for their protection, and the fundamental definitions and doctrines in trademark law. The paper then discusses how developments in AI, IoT, and blockchain technology could forecast new directions for trademarks and the law governing their protection and enforcement.

In terms of structure, we begin by outlining current technological developments to give the reader an appreciation of how technology is evolving and influencing the

retail space. We then consider the core doctrines and principles that underpin trademark law to determine their relevance and role in the world envisioned by this paper – i.e. a world where devices and machines instead of humans make purchasing decisions. In particular, we examine the impact of these advancements on key aspects of trademark law, including the definition of "signs" eligible for trademark protection, the concept of "distinctiveness", the "trademark use" requirement, and the "confusion" test. Finally, we conclude this paper with some reflections on future research and opportunities.

2 Technological Developments and Their Influence on Trademarks, Trademark Proprietors and Consumers

From time to time, technological developments have influenced how humans interact and transact. In the trademark context, AI, IoT, and blockchain technology are revolutionizing how trademark proprietors engage with consumers and, more importantly, protect and enforce their rights against the unauthorized and infringing use of their trademarks by third parties. At the same time, these technological advancements are also influencing consumers, particularly with regard to the process of making purchasing decisions. In this part, we set out the developments in AI, IoT, and blockchain technology to posit that there is a real possibility that, in the foreseeable future, humans may employ interconnected devices and machines as their mechanical agents to make decisions and choices relating to the purchase of goods and services.

We begin our discussion by referring to AI. The field of AI is nothing new. It dates back to the 1950s.[1] AI is significant because it is more than just an algorithm. Algorithms are processes that use logic to solve problems. Computers typically function using algorithms. Given the power and versatility of computers, they can run algorithms at great speed and for vast amounts of data – well beyond the capacity of the human mind.[2] However, AI goes beyond algorithmic analytical processes.[3] AI refers to a "computer process that acts in a manner that an *ordinary person* would deem intelligent".[4] This is possible because AI uses neural networks, the functionality of which resembles the human brain.[5] Thus, AI systems can potentially be used to mimic *human judgement*, enabling the automation of tasks and processes that otherwise require human input and control.

Numerous technologies exist under the broad umbrella of AI. For instance, AI systems employ machine learning techniques that engage *deep neural networks* to facilitate what is known as "deep learning".[6] Such neural networks "enable systems to recognize features in complex data inputs such as human speech, images and

[1] Moerland and Freitas (2021), p. 267.

[2] Sales (2021), p. 24.

[3] *Id.*

[4] Chesterman (2021), p.1.

[5] Warner Jr. (1992), p. 54.

[6] Ofcom (2019), p. 4.

text",[7] and "the performance of these systems in delivering the specific task for which they have been trained now compares favourably with humans".[8] These capabilities of AI have been used for a wide range of activities across many sectors and industries.[9]

More specifically, in the retail sector, the capacity of AI systems to recognize text and images has been put to good use by trademark proprietors. For instance, AI is already being employed to authenticate products so that genuine trademarked items can be distinguished from infringing goods or counterfeits.[10] Major brands such as Louis Vuitton, Chanel and Gucci have partnered with Entrupy, a start-up specializing in product authentication using a combination of AI and microscopy to assess the authenticity of products objectively.[11] Entrupy explains its technology on its website as follows:

> When the item is scanned using our proprietary device and app, a set of microscopic images are collected, then our machine learning algorithms compare them against a database containing millions of records from known authentic and known counterfeit products. Based on the results of this comparison, the AI will either verify the item's authenticity or return an "unverified" result. Each scan from an Entrupy device becomes part of the database, further training the algorithms and making our solution smarter and more accurate.[12]

Not only trademark proprietors but also traders who buy and sell luxury goods have turned to AI to detect infringing and counterfeit items.[13]

While Entrupy uses AI to scan *physical products* to verify their authenticity, AI is also currently being used for counterfeit detection in the online retail space, where there is no opportunity to physically inspect the products sold. Trademark proprietors, and intermediaries acting on their behalf, utilize text and image recognition tools that employ AI techniques to scan through websites and online marketplaces to identify text and images that are identical or similar to trademarks. Indeed, major online marketplaces have also embraced AI to police their platforms for infringing and counterfeit product listings.[14] Such scans can determine potential instances of trademark infringement and counterfeiting.

Also, in the retail space, AI is having a significant impact on consumers. Search engines, such as Google, and online marketplaces like Amazon are using AI to provide a more customized user experience for internet users and shoppers. AI algorithms utilize a combination of data, such as previous purchases, customer ratings, browsing history, and information about complementary products, or

[7] *Id.*

[8] *Id.*

[9] Calo (2018), pp. 406–407.

[10] *See e.g.* Mostert (2017), pp. 10–11; Mertens (2018), p. 37.

[11] Binns (2019).

[12] *See* Entrupy's website under FAQs. https://www.entrupy.com/faq/. Accessed 22 June 2022.

[13] Nemoto (2021).

[14] Iddenden (2021).

products usually bought together, to generate a recommended list of products specific to a particular user/shopper.[15] Indeed, AI is also being tested and employed to determine whether customer reviews about a given product are favourable.[16] Arguably, these tools give consumers greater choice and information about their purchases. There is also literature developing around the phenomenon of "voice shopping" and the manner in which it is altering how consumers interact with trademarks.[17] Popular examples include Amazon's Alexa and Google Home. While interactive voice assistants offer consumers a more intuitive way of searching for goods and services, this has also resulted in consumers having to place greater reliance on AI algorithms when making their purchasing decisions. Indeed, in view of the emergence and proliferation of the metaverse, it is likely that more consumers will turn to shopping on virtual platforms powered by AI that can offer a realistic experience.[18]

Given these trends in relation to AI and its interaction with trademarks, it would not be too imaginative to suggest that, in the foreseeable future, AI may be employed to *fully* automate the process of purchasing goods or services with little or no human involvement *at the point of purchase*.[19] Complete automation may not necessarily happen in all product areas. For instance, consumers of luxury goods may continue to exercise judgement over their purchasing decisions. However, even in those cases, it is very likely that more consumers will turn to the aid of AI when searching for goods or services. Thus, any human judgement will likely be preceded by selections and choices made by AI algorithms. Either way, we can be sure that devices and machines that employ AI will *directly* interact with trademarks with minimal human involvement, if not completely without it.

The prospect of interconnected devices and machines replacing humans in making purchasing decisions becomes even more likely when corresponding developments in IoT and blockchain technology are considered. The term "Internet of Things" or "IoT" refers to "a network of interconnected 'smart objects' that incorporate software, electronic components, sensors, actuators and internet connections through to which data is collected and distributed".[20] By embracing IoT, we are moving towards a "world where physical objects are seamlessly integrated into the information network, and where the physical objects can become active participants in business processes".[21] IoT has numerous applications – from health and fitness trackers to home appliances and automobile sensors;[22] interconnected devices and machines utilize sensors to gather data to provide helpful real-time information that could aid decision-making processes.

[15] Batty (2022), pp. 140–141.

[16] Selvapandian et al. (2020), p. 871.

[17] *See e.g.* Curtis and Platts (2019), pp. 44–45.

[18] Yim (2022).

[19] *See* Allal-Chérif et al. (2021), p. 70.

[20] Capisizu (2018), p. 523.

[21] Haller et al. (2008), p. 15.

[22] Smith (2019), pp. 853–858.

In the area of logistics and supply chain, IoT is already playing a crucial role in *supply chain integrity*, which has implications in the field of trademarks. Tracking mechanisms and sensors are increasingly being incorporated into products and their packaging. Information establishing the authenticity of products can be translated into *machine-readable* formats such as QR codes, bar codes, and RFID tags, which then can be used by human users/consumers with appropriate scanning devices to verify product authenticity.[23] With IoT, the authentication process can be automated[24] – "[t]racking and tracing objects as they are moving along the supply chain is one of the most important basic functions of the Internet of Things. It provides the foundation for product authentication, anti-counterfeiting and other supply chain integrity applications".[25] Thus, when developments in IoT are considered in light of advancements in AI, it is not difficult to imagine a future where interconnected devices and machines directly interact with trademarks in both online and offline contexts in the course of automated processes. Notably, we predict that AI and IoT will be used to automate the process of procuring goods and services for both households and businesses.

However, such a future will become a reality only if humans are willing to place their trust in technology. In this regard, developments in blockchain technology can provide the necessary trust. Conventionally, data and electronic records are stored in centralized databases. Such an approach is vulnerable to data breaches, hacking and manipulation.[26] Instead of a centralized system, blockchain (as the term suggests) *uses a distributed and decentralized methodology for storing* data.[27] Essentially, any data or electronic record is "mined" into blocks and chained (or linked) together using a hash (or timestamp) across a decentralized network of "nodes".[28] While nothing is "un-hackable", blockchain's security works because of its decentralized approach.[29] Victims of hacking on the blockchain are those who attempted to centralize a decentralized system.[30]

Although, in the past, blockchain technology was mainly associated with cryptocurrencies such as Bitcoin, in more recent times it has provided the technical basis for a wide range of applications and uses.[31] Significantly, many categories and types of data can be represented on a blockchain. This means that blockchain technology can be used to represent intellectual property assets such as art, music,

[23] Sloane et al. (2020), pp. 1248–1249 ("Some brand owners are also adopting or currently testing forensic and tracking technologies to help verify the authenticity of their goods. These technologies include QR codes (or similar technology), RFID (radio-frequency identification) tools, and other real-time tracking tools").

[24] Paez and La Marca (2016), p. 32 ("Enterprises throughout different industries are also increasingly utilizing IoT logistics applications to automate and streamline their supply chain management processes").

[25] Haller et al. (2008), p. 23.

[26] *See e.g.* Pezoulas et al. (2020), p. 142.

[27] Koonce (2016), p. 3.

[28] Marvin (2017).

[29] *Id.*

[30] *Id.*

[31] Pech (2020), pp. 1–2.

and films, as well as transactional and supply-chain information about goods protected by intellectual property rights.[32] More specifically, in the trademark context, trademark proprietors currently employ blockchain technology to provide a mechanism to authenticate their products. A simple QR code, bar code, or RFID tag on a product or its packaging can be linked to a record on the blockchain providing information about the product's trademark, manufacturer, place of origin, and current location on the supply chain. Indeed, blockchain technology is also being used to digitize trademarks so that their registration and use can be tracked and traced.[33] The "Smart Trade Mark" that the Australian Intellectual Property Office has recently introduced is an example of this.[34] In essence, blockchain technology can facilitate the means for verifying whether a given use of a trademark in relation to any goods or services is authorized and whether products bearing a particular trademark are genuine. These applications of blockchain technology make a strong case in favour of the future envisioned by this paper – i.e. a future where interconnected devices and machines engaging AI and IoT will directly interact with trademarks in making purchasing decisions for their human principals.

From the discussion above, it is clear that AI, IoT, and blockchain technology can be likened to a "trinity" with a significant impact on trademarks and the law governing their protection and enforcement. Their integration presents a complex interplay of new opportunities and challenges, revealing a potential for misalignment between current trademark law and these technological advancements. As these technologies reshape the landscape of trademark usage and enforcement, they also open the door for novel forms of infringement by unauthorized parties. Thus, there is a critical need to re-examine the foundational ideas, definitions, and doctrines that underpin trademark protection to fully grasp the evolving role and functions of trademarks in this new era.

In the next part of this paper, we delve deeper into these issues to highlight gaps, conflicts, and misalignments between the existing legal framework dealing with trademarks and the evolving technological landscape. Our aim is to contribute towards a more informed dialogue on how trademark law can and should adapt to remain effective and relevant amidst the rapid technological advances and novel modes of infringement presented by the synergistic influence of AI, IoT, and blockchain technology.

3 New Bearings for Trademarks?

In the preceding part, we delved into the transformative impact of AI, IoT, and blockchain technology on the interaction between trademarks, trademark proprietors, and consumers. This transformation, as we have seen, is redefining the landscape of how trademarks are used and enforced, challenging our conventional

[32] Hugendubel (2021), p. 3.

[33] *See* Rose (2020).

[34] *See* Australian IP Office's website. https://smarttrademark.search.ipaustralia.gov.au/. Accessed 11 September 2022.

understanding of trademark doctrine. As these technologies increasingly mediate interaction between brands and consumers, it becomes imperative to reassess the traditional functions and role of trademarks. The necessity of this analysis stems from the potential for a significant shift in how trademarks are perceived and utilized in a world increasingly dominated by smart technologies and automated decision-making processes. Here, we aim to bridge the gap between the rapid technological advancements outlined in the previous part of this paper and the traditional legal doctrines applicable to trademarks, exploring how the latter may evolve or need to be reinterpreted in the context of AI, IoT, and blockchain technology. This exploration is not just academic – it is a crucial step in ensuring that trademark law remains relevant and effective in protecting both the rights of trademark proprietors and the interests of consumers in a rapidly changing digital world.

3.1 The Diminishing Functions of Trademarks

Reflecting on the transformative effects of AI, IoT, and blockchain technology, we move on to an in-depth analysis of the evolving functions of trademarks in an increasingly digitized world. The shift in the perception and application of trademarks, driven by these technological advancements, calls for a thorough re-examination of their conventional functions. We delve into the historical progression of the functions of trademarks, scrutinizing how this evolution impacts their significance in an era shaped by AI-driven decision-making and interconnected technologies. This evaluation is vital for determining how trademark law should adapt, ensuring its effectiveness and relevance in safeguarding the rights of trademark proprietors and addressing the needs of consumers in a dynamically changing digital environment.

Marks have existed since ancient times. But, over time, their role and functions have evolved. Historically, marks were used to designate the *ownership* of objects.[35] It is speculated that marks first appeared on cattle and other animals even before humans could read and write.[36] Indeed, the term "branding" (which means "to burn") appears to have originated from the context of *cattle branding*[37] and has survived the test of time to be used today in the discipline of marketing. However, when the context changed, the same mark also served the function of indicating *trade origin*. The following explanation, which makes use of animal branding as an example, clearly establishes this point:

> As we know from our study of the "Western" novels, the brands on these beasts served the purpose of owner's marks, enabling the owners to reclaim any of their stock which strayed, were stolen by "rustlers," and so on. Now, when the beast was sold, the brand would immediately become a trademark and tell any purchaser who had reared the animal. Even after slaughter, for all

[35] Ruston (1955), p. 128; Nasser (2008), p. 100.

[36] Diamond (1983), p. 223.

[37] *Id*.

> I know, the brand would survive on the hide, identifying that, in its turn, to a purchaser.[38]

In other words, marks used to designate the ownership of things were transformed into indications of *trade origin*. Indeed, during ancient times, marks were used to designate the origin of various products, such as bells, lamps, pottery, porcelain, bricks, stone and terra cotta, marble, glassware, bronze instruments, gold, silverware, knives, and other iron articles, gems and textiles.[39] Marks even appeared on consumables such as bread and spirits.[40] In most cases, the ancient use of marks identified the *maker* or *manufacturer* of the article concerned. To date, the origin function of trademarks remains the fundamental, core, and essential function of marks used in trade. On many occasions, the origin function of trademarks has been endorsed by courts across the globe,[41] including the Court of Justice of the European Union (CJEU).[42]

During medieval times, marks inscribed onto articles and objects were also used for regulatory purposes. Guild marks exemplify this, "the principal purpose of which was to fix the responsibility for poor quality merchandise".[43] The mark identified the party responsible for producing the faulty product. In other words, marks were used as a measure of quality control. This also meant that products bearing a particular mark were expected to maintain a certain consistent quality, giving rise to the *quality assurance function* attributed to trademarks.[44] Indeed, with the expansion of trade, and when goods were traded outside the maker's or manufacturer's immediate locality,[45] consumers began to rely on trademarks to assure themselves of the quality of the underlying goods through past experience or reputation. Often, consumers are unaware of the *actual* origin of the goods sold under a given trademark.[46] Instead, trademarks represent "merely that the goods in connection with which it is used emanate from the same – possibly anonymous –

[38] Ruston (1955), p. 128.

[39] Diamond (1983), pp. 222–229.

[40] Paster (1967), p. 554.

[41] *See e.g. Hanover Star Milling v. Metcalf* 240 U.S. 403, 412–413 (1916) (US Supreme Court); *E & J Gallo Winery v. Lion Nathan Australia Pty Ltd* (2010) 241 CLR 144, [52] (High Court of Australia); *Société des Produits Nestlé SA v. Petra Foods Ltd* [2016] SGCA 64, [38] (Singapore Court of Appeal).

[42] *See e.g.* Case C-206/01, *Arsenal Football Club plc v. Matthew Reed* [2002] ECR I-10273, [48] ("In that context, the essential function of a trade mark is to guarantee the identity of origin of the marked goods or services to the consumer or end user by enabling him, without any possibility of confusion, to distinguish the goods or services from others which have another origin").

[43] Diamond (1983), p. 224.

[44] Hannak (1974), p. 363.

[45] Paster (1967), p. 552 ("as soon as a particular maker, by the excellence of his manufacture acquired a reputation outside of his immediate locality, in order to visualize and perpetuate that reputation he adopted and used a mark to distinguish his product from others").

[46] Schechter (1927), p. 816 ("It has been repeatedly pointed out by the very courts that insist on defining trademarks in terms of ownership or origin that, owing to the ramifications of modern trade and the national and international distribution of goods from the manufacturer through the jobber or importer and the retailer to the consumer, the source or origin of the goods bearing a well known trademark is seldom known to the consumer"); Hannak (1974), p. 364 ("Consumers rarely know or care about the origin of a product").

source or have reached the consumer through the same channels as certain other goods that have already given the consumer satisfaction, and that bore the same trademark".[47] It is therefore understood that the origin and quality assurance functions of trademarks are interlinked, with the former enabling the latter.[48]

While the origin and quality assurance functions of trademarks are very well established, in recent times it has been acknowledged that trademarks possess other functions. For instance, in the context of the European Union, aside from the origin and quality assurance functions of trademarks, the CJEU has recognized that trademarks possess additional functions such as communication, investment and advertising.[49] The CJEU has held that a trademark may be used not only with the objective of indicating, by means of that mark, the origin of the underlying goods or services but also "for advertising purposes designed to inform and persuade consumers".[50] Thus, trademarks possess an advertising function and may be used by their proprietors "in sales promotion or as an instrument of commercial strategy".[51] The CJEU has also drawn a distinction between the advertising and investment functions of trademarks. Thus, the use of a trademark "to acquire or preserve a reputation capable of attracting consumers and retaining their loyalty"[52] represents the exercising of its investment function.

Although the CJEU has referred to a "communication" function, it has not yet defined or provided any guidance on what that function entails.[53] However, Advocate General Paolo Mengozzi's opinion in *L'Oréal v. Bellure*[54] indicates that the communication function of trademarks comprises two components. The first is *information communicated directly by the sign* that the trademark consists of, such as information that may be discerned from the descriptive elements of a sign that provide insights into the underlying product's characteristics.[55] The second is *accumulated information* relating to the trademark as a result of promotion and advertising carried out by the proprietor, such as messages relating to non-physical characteristics of the underlying product, that creates an image of the product or the company in terms that may be general (e.g. quality, trustworthiness, reliability) or particular (e.g. a specific style, luxury, strength).[56] In view of the latter component, it has been argued that the communication function entails an "expressive"

[47] Schechter (1927), p. 816.

[48] *See e.g. Thomas Pride Mills Inc v. Monsanto Co* 1967 WL 7489 (US District Court for the Northern District of Georgia, 14 June 1967), *3 ("The primary functions of a trademark are to indicate a single source of origin of the articles to which it refers and to offer assurance to ultimate consumers that articles so labeled will conform to quality standards established and, when licensed to others, controlled by the trademark proprietor").

[49] Case C-487/07, *L'Oréal SA v. Bellure NV* [2009] ECR I-05185 (*L'Oréal*), [58]; Joined Cases C-236/08 to C-238/08, *Google France SARL v. Louis Vuitton Malletier SA* [2010] ECR I-02417 (*Google*), [77].

[50] *Google*, [91].

[51] *Id.* at [92].

[52] Case C-Case C[323/09, *Interflora Inc v. Marks & Spencer plc* [2011] ECR I-08625, [62].

[53] Kur (2014), p. 12.

[54] *L'Oréal*, Opinion of AG Mengozzi.

[55] *Id.* at [54].

[56] *Id*.

aspect.[57] As a result of this expressive function, trademarks have become indicators of the social status, preferences, and aspirations of those who use products associated with them.[58] Indeed, US courts have also acknowledged this expressive function of trademarks.[59]

As the discussion above demonstrates, marks applied in trade have had a long history, and their role and functions have evolved over time. However, that evolutionary process has by no means ended. We posit that the role and functions of trademarks will continue to evolve. This is particularly so in light of the technological advancements in AI, IoT, and blockchain technology that we highlighted earlier. How, then, might the role and functions of trademarks evolve in a world where interconnected devices and machines interact directly with trademarks, making purchasing decisions with little or no human intervention?

Insofar as humans are concerned, trademarks convey specific information that enables them to make informed choices about their purchases. This is possible because, as we noted before, trademarks signal a singular trade origin. By doing so, they guarantee consistent quality, which consumers infer from prior experience or reputation. In essence, trademarks reduce consumer search costs and make markets more efficient. The following observation that we have taken from the law and economics literature lucidly illustrates this point:

> Suppose, then, that a consumer has a favorable experience with brand *X* and wants to buy it again. Or suppose he wants to buy brand *X* because it has been recommended by a reliable source or because he has had a favorable experience with another brand produced by the same producer. Rather than reading the fine print on the package to determine whether the description matches his understanding of brand *X*, or investigating attributes of all the different versions of the product (of which *X* is one brand) to determine which one is brand *X*, the consumer will find it much less costly to search by identifying the relevant trademark and purchasing the corresponding brand.[60]

Judges, too, have acknowledged the search-cost argument. A notable instance was when the US Supreme Court made the following observation:

> In principle, trademark law, by preventing others from copying a source-identifying mark, 'reduce[s] the customer's costs of shopping and making purchasing decisions,' … for it quickly and easily assures a potential customer

[57] Fernandez-Mora (2021), p. 1397.

[58] *See e.g.* Dreyfuss (1990), pp. 397–398; Gangjee (2013), p. 35; Keller and Swaminathan (2020), p. 119.

[59] *See e.g. Matal v. Tam* 137 S. Ct. 1744 at 1760 (2017) ("… trademarks often have an expressive content. Companies spend huge amounts to create and publicize trademarks that convey a message. It is true that the necessary brevity of trademarks limits what they can say. But powerful messages can sometimes be conveyed in just a few words"). Arguably, it is the expressive function of marks that make parodies and other expressive uses of trademarks possible. The famous "Barbie Doll" cases demonstrate this. *See* Mattel Inc v. Walking Mountain Productions 353 F.3d 792, 802 (9th Cir. 2003) ("Mattel, through impressive marketing, has established Barbie as 'the ideal American woman' and a 'symbol of American girlhood' for many"); *Mattel Inc v. MCA Records Inc* 28 F.Supp.2d 1120 (1998) (confirming that "Barbie" represented certain *values*).

[60] Landes and Posner (2003), p. 167.

> that this item – the item with this mark – is made by the same producer as other similarly marked items that he or she liked (or disliked) in the past.[61]

The value of trademarks is even more significant when goods possess *unobservable features* that are crucial to consumers in making their purchasing decisions. The following observation made from an economic standpoint illustrates the potential of trademarks in this regard:

> In many markets, sellers have much better information as to the unobservable features of a commodity for sale than the buyers. This is known as information asymmetry. Unobservable features, valued by the consumer, may be crucial determinants of the total value of the good. Observable features can often be imitated to the smallest detail, even though huge differences remain in the unobservable features of the product. In the absence of trademarks, faced with the choice between goods which look identical, the consumer will only by chance pick the one with the desirable unobservable qualities.[62]

In essence, "[t]he economic role of the trademark is to help the consumer identify the unobservable features of the trademarked product."[63]

However, as noted earlier, this paper postulates a future where interconnected devices and machines acting as mechanical agents for their human principals will make purchasing decisions. This means that the interaction between humans and trademarks *will no longer be direct*. Humans will interact with AI systems. And in turn, AI systems will interact with trademarks. However, AI systems will not rely on trademarks in the same way that humans do. AI systems will possess the capacity and processing power to make purchasing decisions based on a vast array of data, including trademark-specific information, price, product specifications, customer reviews, promotional information and offers, information about competing and complementary products, and post-sale service reviews. As such, when interacting with AI systems, trademarks will not assume the same role they do when interacting with human consumers.

For AI systems, trademarks will merely represent *a class of information* that relates to a given product – a variable among many that will go into the AI's decision-making process.[64] Indeed, even the essential function of trademarks, namely that of indicating origin, may not have the same significance, as AI systems are likely to be able to accurately identify a product's exact origin and supply-chain information without reference to trademarks. In the human world, trademarks signal to consumers that products bearing them originate from a *single undertaking* responsible for the manufacture of the underlying product, although consumers may be completely oblivious to the exact details of the manufacturer and its distribution channels. When AI systems are used to make purchasing decisions, the *actual and*

[61] *Qualitex Co v. Jacobson Products Co Inc* 514 US 159, 163 (1995).

[62] Economides (1988), p. 526.

[63] *Id.*

[64] Grynberg (2019), p. 204 ("But Al shoppers will have the capability and patience to gather and process far more distinguishing context than humans. A trademark may just be one input among many considered by the Al …").

exact origin of a product will be known to the system even without any reference to trademarks. Thus, the origin function of trademarks is of no significance to AI systems.

Indeed, AI systems are likely to make selections and choices that are far better and more objective than what any human can make solely on the basis of trademarks. This superiority is for a number of reasons. First, AI systems will have access to information that trademarks fail to communicate. After all, trademarks cannot be used as a proxy for product-specific information that can only be ascertained by referring to the fine print on the packaging or product description.[65] It is often the case that a wide range of products may be sold under the same trademark. Thus, a mere reference to the trademark does not give the prospective consumer any information relating to the specific product unless the consumer has previously made use of that particular product or is making an inference as to its quality and attributes on the basis of other products sold under the same trademark. In contrast, AI systems are likely to be able to capture and process the fine distinctions between the full range of products sold under a given trademark. As such, unlike consumers, who are constrained by the limited information that trademarks convey, AI systems are likely to be able to make distinctions as to the quality and other characteristics of products sold under a given trademark. This will lead to purchasing decisions that are more accurate, well-informed and better suited to the needs of individual consumers.

Second, and somewhat paradoxically, there are times when trademarks can mislead consumers. Given the global nature of trade, identical products sold under the same trademark may, for pragmatic reasons, be manufactured in factories around the world by multiple entities under the control of a single undertaking.[66] While, theoretically, all such products sold under the same trademark must bear the same quality (after all, that is precisely what trademarks promise), this may not be the case in practice. For instance, Cadbury chocolates produced in the United Kingdom differ in quality from those produced under the same trademark in the United States.[67] Indeed, a recent study conducted in the European Union noted that:

> It has been recognised at the EU level that the presence of products on the EU single market that are marketed as identical in several Member States but which have a significantly different composition or characteristics, exists. Although the brand name, packaging design and marketing look at a first glance the same, research conducted in different Member States has revealed products on the EU's Single Market that differ in their composition, basic materials used in production or its share in the product, all depending on the country of their purchase. The manufacturer does not seem to be obliged to

[65] *Id.* at p. 208 ("It may be helpful to use a brand as a proxy, but at the end of the day, an APPLE MacBook is not an APPLE MacBook AIR is not an APPLE MacBook Pro is not an APPLE iPhone 7 (or 8 or 9 or X) is not an APPLE iPad, and so on. Strong marks may cause us to overlook distinctions of this sort").

[66] Denicola (1996), p. 77 ("Trademarks could be understood as indications, *not necessarily of physical origin, but of a more general connection between the trademark owner and the trademarked goods*").

[67] Roberts (2016).

> inform the consumer clearly that the product of a familiar brand, on the market in one specific EU country, may differ in its composition, weight, quality or other related characteristics, in another EU country.[68]

A variety of reasons may contribute to the disparity in quality, some within and others outside the control of the trademark proprietor. For instance, the quality of products sold under a given trademark may vary from territory to territory in view of factors such as regulatory requirements prevailing in the market[69] or the quality of raw materials available.[70] On the other hand, since trademark rights are territorial,[71] trademark proprietors may also use trademarks to segment markets and discriminate on the basis of quality, often resulting in price variations between products sold in different markets under the same trademark.[72] However, given the proliferation of parallel trade, which is legitimate in some countries[73] or territories[74] and not in others,[75] it may be possible for products sold under the same trademark to *bear identical observable features* but *differ in quality*. In such cases, unless consumers look beyond the trademark to identify the place of manufacture and the ingredients used, as set out on the packaging, they may not be able to detect the differences in quality and may thus make purchasing decisions that do not meet their expectations. But when humans begin to rely on AI to make purchasing decisions on their behalf, AI systems are likely to be able to make selections and choices based on a wide range of information, which may allow such systems to identify differences in quality even in respect of products sold under the same trademark.[76]

In essence, the origin function of trademarks will not bear the same weight and value when AI systems begin to interact with trademarks. Not only will AI systems place no reliance on trademarks for their origin function but, more importantly, such systems will have the capacity to overcome discrepancies and gaps in the

[68] Vítová (2018), p.5.

[69] Roberts (2016) ("In the UK, chocolate manufacturers have to include a minimum of 20% cocoa in their bars. In the US, this figure is significantly lower, as companies can release chocolate that contains as little as 10% cocoa").

[70] Glennie (1999), p. 1102.

[71] Dinwoodie (2017), p. 1673.

[72] Andrade (1993), p. 415.

[73] Parallel imports are generally legitimate in countries that adopt a policy of international exhaustion of rights. But even in those countries, the law may create exceptions that allow trademark proprietors to object to parallel imports in limited circumstances.

[74] The European Union adopts a policy of regional exhaustion of rights. Thus, parallel trade is permitted provided that it takes place between EU Member States. But when parallel imports originate from outside the European Union, trademark proprietors may exercise their rights to prevent such imports even when they had been placed in the non-EU market by the proprietor or with the proprietor's consent.

[75] In counties that adopt a policy of national exhaustion, parallel imports are prohibited under the law.

[76] For instance, AI systems are likely to be able to detect (on the basis of customer reviews, news reports etc.) that Cadbury products manufactured in the United States attract a negative consumer experience (i.e. are perceived as lower in quality) compared to Cadbury products manufactured in the United Kingdom. Thus, when AI systems make choices between identically described Cadbury products (e.g. "Cadbury Milk Chocolate"), they may favour products manufactured in the United Kingdom. Consumers may not have the capacity to make these distinctions unless they experience the difference in quality and exercise caution in making future purchases.

information that trademarks convey. In other words, AI systems are likely to make superior and better-informed purchasing decisions than humans, who rely strictly on trademarks and their origin function as a guarantee of product quality.

Third, unlike humans, AI systems (*at least for now*) do not possess an *inherent ability* to feel or entertain emotions.[77] It has been noted that conventional models of AI "do not include emotions"[78] and that "AI is currently able to perform data-based tasks, but not feeling-based tasks based on human understanding and experience".[79] In essence, machines are "intelligent, but they don't love or hate".[80] Arguably, this means that AI systems will not be influenced or persuaded by the advertising, investment, and communication functions of trademarks. As noted before, the advertising function of trademarks is designed to inform and *persuade* consumers. However, AI decision-making is driven by logic and data. Similarly, the investment function of trademarks may become redundant against AI. The investment function enables trademarks to attract and retain loyalty. However, not only do AI systems "lack brand loyalty but also they can evaluate the quality of a product independently of brand recognition".[81] Even the communication function of trademarks is likely to have less effect on AI systems. The communication function entails two aspects – informational and expressive. The informational aspect may have some relevance to the AI decision-making process, as AI systems may possess the ability to attach specific meanings to *descriptive elements* of trademarks. However, the expressive aspect of the communication function is not likely to have any influence. For instance, "Volvo" and "BMW" not only function as indications of origin but also convey a particular image – of *safe driving*, in the case of the former, and of *driving pleasure*, in the case of the latter.[82] However, AI systems are unlikely to be influenced by the expressive features of such trademarks. This does not mean that AI systems will not make assessments about the safety, comfort, or other characteristics of products. But such assessments will be based on available data without reference to the trademarks under which products are sold. In other words, when a consumer decides to rely on AI to purchase goods or services, the AI's search for suitable products for its human principal will be "trademark neutral". The AI's purchasing decisions, selections and choices are likely to be objective, based on data, and to cater specifically to the tangible requirements of the consumer.

The discussion above suggests that when interconnected devices and machines powered by AI begin to make purchasing decisions, they are unlikely to interact with trademarks in the same way humans do. Notably, the origin function of trademarks (their *essential* function) and the *secondary* functions (of quality assurance, advertising, investment, and communication) will not have the same

[77] Ćapeta (2017), p. 139 ("Even if a robot is more capable of mastering all human formal knowledge, it is not capable of mastering feelings").

[78] Clocksin (2003), p. 1736.

[79] Bakpayev et al (2022), p. 90.

[80] Turkle (2005), p. 63.

[81] Klaus and Zaichkowsky (2020), p. 390 ("Not only do bots lack brand loyalty but also they can evaluate the quality of a product independently of brand recognition").

[82] Fernandez-Mora (2021), p. 1398.

effect. But this does not mean that trademarks will play no role when AI makes purchasing decisions. For instance, just as with human consumers, it is possible that AI systems will treat trademarks as a proxy for product quality or other characteristics. However, this would not be in the same way as for humans. Humans rely on their past experience of a particular product (or a recommendation of a past user of a product) as a reference for future purchases of the same product or similar products sold under the same trademark. In contrast, AI systems neither consume nor experience products. AI systems do not (and will not) possess the *innate* ability to associate product quality with trademarks on the basis of past experience. However, AI systems can generate positive or negative perceptions about a particular product or range of products sold under a given trademark on the basis of available data, such as customer reviews, statistics, certifications, and other similar attributes. Once AI forms such a perception, AI systems will likely use trademarks to determine whether certain brands should be included or excluded from the AI's search parameters. Indeed, machine learning has already enabled AI systems to sense and recognize human emotions and respond to them accordingly.[83] Thus, when humans begin to use AI to assist them with or replace them in the product purchasing process, it is likely that AI systems will learn about the preferences of their human principals on the basis of how the latter experience the purchased products. Thus, inferentially, AI will have the capacity to associate trademarks with product quality.

In essence, although the functions of trademarks will not have the same effect on AI systems as they do on humans, AI will likely use trademarks when making purchasing decisions. This means that interconnected devices and machines powered by AI systems will interact with trademarks in the future contemplated in this paper. As such, there is great utility in digging deeper into the "AI-trademark" interface, which we do next in this paper, where we consider some of the fundamental concepts that underpin trademark protection, namely the definition of "signs" eligible for trademark protection, the concept of "distinctiveness", the "trademark use" requirement and the analysis of "confusion" in the infringement context.

3.2 "Signs" Beyond Human Perception

While interconnected and intelligent devices and machines are likely to interact with conventional trademarks, albeit not in the same way that humans do, it is also possible that a new breed of *unconventional* "signs" will emerge that could enable such devices and machines to distinguish the goods or services of one undertaking from those of others. Examples of such unconventional signs include QR codes, bar codes, and RFID tags. These *machine-readable formats* can capture a wide range of information, including trademark-specific information about a given product. They are "signs" insofar as they contain information that can facilitate the function of distinguishing the goods or services of one undertaking from those of others. Indeed, when humans begin to employ AI to assist or replace them in the process of

[83] *See e.g.* Picard (2008), p. 413; Sourdin (2018), pp. 1128–1130.

making purchasing decisions, it is likely that AI systems will interact directly with machine-readable formats and rely on them to ascertain product-specific information, including the trademark under which a product is sold. Thus, just as conventional trademarks enable humans to distinguish between products of different traders, machine-readable formats, such as QR codes, will enable interconnected and intelligent devices and machines to make the same distinctions without human intervention. In other words, machine-readable formats are capable of performing the essential, if not primary, function of trademarks – i.e. to indicate origin. But are such machine-readable formats "signs" within the meaning that is usually attached to "trademarks"? While this question might sound intriguing, if not even absurd, there is utility in responding to it, as we explain below.

Take the following hypothetical example. Assume that a trader, in contemplation of the future postulated by this paper, begins to represent its registered trademark in the form of a QR code. That is to say that the trader digitally embodies its existing trademark in a QR code. The QR code is unique, and it stores the trader's trademark in a secure blockchain along with other information relating to a given product of the trader. The trader places the QR code on its products and displays it on websites, social media platforms, and online marketplaces where it lists its products for sale. When the QR code is scanned, the trader's trademark becomes visible, and the information thus obtained can be used to verify the authenticity of the underlying product. In essence, the QR code is a digital representation of the trader's trademark in a machine-readable format. Now assume that an invidious and shrewd counterfeiter manages to duplicate the trader's QR code and uses it in connection with the sale of counterfeit products. Assume also that the counterfeiter succeeds in manipulating the underlying data represented by the QR code, which, despite the immutable nature of blockchain, cannot be ruled out, owing to the numerous vulnerabilities.[84] Lastly, assume that AI systems in search of the trader's authentic products are misled by the duplicate QR code and are directed to the counterfeiter's products instead.

In the hypothetical example set out above, has the counterfeiting trader committed a trademark infringement? Two related questions arise in this regard. First, are machine-readable formats *as such* capable of being registered as trademarks to begin with? If the answer to this is in the affirmative, the unauthorized act of duplicating and utilizing a QR code, as in the hypothetical example above, *could* amount to an infringement. Second, and in any case, does the unauthorized duplication and use of such machine-readable formats in relation to the sale of third-party products amount to an infringing use *of the trademarks they digitally embody and represent* as part of the "information" they hold? If the answer to this is in the affirmative, the unauthorized act of duplicating and utilising a QR code, as in the hypothetical example above, *could* amount to an infringement, *even if the QR code as such is not a registered trademark.*

3.2.1 Are Machine-Readable Formats Registrable as Trademarks?

The answer to this question must begin with a reference to the definition of trademarks. Trademarks have conventionally been understood as "signs" that

[84] *See e.g.* Castonguay and Smith (2020), pp. 367–380.

indicate the origin of goods or services to which they relate. This is clear from the definition of trademarks as it appears in the Agreement on the Trade-Related Aspects of Intellectual Property Rights (TRIPS),[85] which is an important source of international intellectual property law, as it binds all member states of the World Trade Organization (WTO). TRIPS defines a trademark in Art. 15(1) as "[a]ny sign, or any combination of signs, capable of distinguishing the goods or services of one undertaking from those of other undertakings".[86] TRIPS also provides that "[s]uch signs, in particular words including personal names, letters, numerals, figurative elements and combinations of colours as well as any combination of such signs, shall be eligible for registration as trademarks".[87] In addition, TRIPS permits WTO members to confine trademarks to signs that are "visually perceptible".[88]

From the provision in TRIPS referred to above and the examples set out therein, it appears that for signs to function as trademarks, they must be capable of "human perception". Although the definition of a trademark as it appears in the first sentence of Art. 15(1) of TRIPS does not expressly say so, the examples set out in the said provision, and the possibility to confine trademarks to *visually perceptible* signs indicate that signs must be capable of being perceived by humans before they are to be treated as trademarks. However, since the visual perceptibility requirement is optional, it is logical to suggest that signs can function as trademarks as long as they can be perceived by *any of the human senses* – i.e. vision (or sight), audition (or hearing), olfaction (or smell), gustation (or taste), or taction (or touch).

Indeed, the following observations in a recent publication of the World Intellectual Property Organization (WIPO) has recognized the importance of human perception in determining the registrability of trademarks and their infringement:

> Trade marks are intended to distinguish the origin of goods and services and to prevent consumer confusion. Current trade mark law is therefore based on concepts of human perceptions and recollection both for determining whether a trademark is registrable and whether it is infringed …[89]

In essence, human perceptibility is a *minimum threshold requirement* for a sign to be eligible for registration as a trademark. However, not everything that we can see, hear, smell, taste, or feel qualifies as a "sign" within the meaning of trademark law. Unless such signs are "*capable of distinguishing* the goods or services of one undertaking from those of other undertakings", they cannot be regarded as trademarks for registration purposes. According to an authoritative commentary on

[85] Agreement on Trade-Related Aspects of Intellectual Property Rights, 16 April 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299, 33 I.L.M. 1197 (1994) (TRIPS).

[86] *Id.* at Art. 15(1) (first sentence).

[87] *Id.* at Art. 15(1) (second sentence). This definition is used in trademark statutes and laws across the globe.

[88] *Id.* at Art. 15(1) (last sentence) ("Members may require, as a condition of registration, that signs be visually perceptible").

[89] WIPO (2020), p. 12.

TRIPS, Art. 15(1) makes protectability of signs and combinations of signs as a trademark depend on their *abstract capability* to distinguish the goods or services of one undertaking from those of other undertakings.[90] In some jurisdictions, the "capacity to distinguish" criterion has been used as a threshold requirement that a sign must meet before it is examined for distinctiveness/descriptiveness.[91] This means that signs that do not meet this minimum threshold will, from the outset, not qualify as trademarks. Thus, it is not surprising that the transparent bin or collection chamber of a vacuum cleaner,[92] the shape of a forklift truck, torch or wristwatch,[93] the three-dimensional shape of an ivory-coloured tile used for playing SCRABBLE,[94] and the shape of a pipe fitting as represented by a two-dimensional image[95] failed to qualify as "signs", because none of them were able to meet the relatively low threshold of "capacity to distinguish". The upshot of this is that for any sign to become registrable as a trademark, it must impart "information" that is not only capable of human perception but also possesses the capacity to distinguish the goods or services of one trader from those of others.

Insofar as machine-readable formats are concerned, the trademark-specific information they embody, which enables the distinguishing function, cannot be perceived by any of the human senses. Consumers require the assistance of an intermediate device (e.g. a QR code scanner or bar code reader) to gain access to the trademark-specific information that such machine-readable formats embody. A distinction has to be drawn between the visually perceivable elements of machine-readable formats (*see* Figs. 1, 2, 3) and the *information* they contain. Once this distinction is drawn, it should become immediately apparent that the perceivable features of such machine-readable formats are difficult to categorize as "signs" within our conventional understanding of trademark law.

Indeed, given the widespread prevalence and use of QR codes, bar codes, and RFID tags as sources of information, the public associate such machine-readable

[90] Schmidt-Pfitzner (2009), p. 307.

[91] *See* Ng-Loy (2014), p. 334; Bently et al (2018), p. 971.

[92] Case C-321/03, *Dyson Ltd v. Registrar of Trade Marks* [2007] ECR I-00687, [40] ("Accordingly, the answer to be given to the national court must be that Article 2 of the Directive is to be interpreted as meaning that the subject-matter of an application for trade mark registration, such as that lodged in the main proceedings, which relates to all the conceivable shapes of a transparent bin or collection chamber forming part of the external surface of a vacuum cleaner, is not a 'sign' within the meaning of that provision and therefore is not capable of constituting a trade mark within the meaning thereof").

[93] Joined Cases C-53/01 to C-55/01, *Linde AG, Winward Industries Inc and Rado Uhren AG v. Deutsches Patent- und Markenamt* [2003] ECR I-03161.

[94] *J W Spear& Son Ltd v. Zynga Inc* [2013] FSR 28, [47] ("In my judgment the Tile Mark does not comply with the first condition for the following reasons. As Zynga rightly contends, the Tile Mark covers an infinite number of permutations of different sizes, positions and combinations of letter and number on a tile. Furthermore, it does not specify the size of the tile. Nor is the colour precisely specified. In short, it covers a multitude of different appearances of tile. It thus amounts to an attempt to claim a perpetual monopoly on all conceivable ivory-coloured tile shapes which bear any letter and number combination on the top surface. In my view that is a mere property of the goods and not a sign").

[95] *National Fittings (MD) Sdn Bhd v. Oyster Plc* [2006] 1 SLR(R) 712, [136] (This was a case decided by the Singapore High Court where the Court held that the marks in question did "not seem to be able to pass even the relatively low threshold criterion set out in the definition of a 'trade mark' in Sec. 2 of the TMA").

Fig. 1 Image of a QR code generated using an online tool comprising the following text: "MY TRADEMARK This is an authentic product"

Fig. 2 Image of a bar code

Fig. 3 Image of an RFID tag

formats with their functional use – i.e. as tools that provide information upon scanning. A consumer who sees a machine-readable format attached to a product or listing on a website will not associate it with a single undertaking, although the information contained in it would enable the consumer to determine the trademark under which the product is sold, the details of the manufacturer, and a wide range of product-specific information. Thus, insofar as consumers are concerned, machine-readable formats are purely functional tools devoid of distinctive character.[96] Importantly, if a machine-readable format, such as a QR code, is registered as a trademark, this would essentially grant the registrant a monopoly over the use of such formats, leading to anti-competitive outcomes.[97] For this reason, permitting machine-readable formats "as such" to be registered as trademarks is unquestionably contrary to the public interest.

From all of the above, it is clear that although machine-readable formats can embody information that performs the distinguishing function, they are not likely to be regarded as "signs" within our current understanding of trademark law. However, in the future anticipated by this paper, we are likely to see interconnected and smart devices and machines interacting directly with machine-readable formats, such as QR codes, in order to distinguish the goods and services offered by one trader from those of others when making purchasing decisions for their human principals. In other words, such devices and machines will begin to perceive

[96] Kulseth (2012), pp. 40–43.

[97] To the naked eye, all QR codes look alike. This means that if a given QR code is registered as a trademark for a particular class of goods or services, no other trader dealing in the same or similar class of goods or services will be able to use a QR code for informational purposes, as the similarity of the QR codes would give rise to potential infringement.

machine-readable formats embodying trademark-specific information as "signs" capable of performing the distinguishing function. Thus, if we look at trademark law from a slightly different vantage point – i.e. from the perspective of devices and machines as opposed to that of humans – it is likely that unique and distinct machine-readable formats may be regarded as "signs". So, should trademark law alter its perception and extend beyond the human realm to embrace that of the machine? Given the advancements in AI, IoT, and blockchain technology, and the real possibility that interconnected devices and machines will interact directly with trademarks embodied in machine-readable formats, we posit that this question will require a response in the not-so-distant future.

3.2.2 Can the Unauthorized Third-Party Use of Machine-Readable Formats Amount to a Trademark Infringement?

Although machine-readable formats are unlikely to be registered as trademarks (*on a conventional understanding of trademark law*), there is still a need to address the second question posed above – i.e. whether the unauthorized duplication and use of machine-readable formats that digitally embody trademarks can amount to an infringement. Merely because machine-readable formats do not qualify for registration as trademarks, it does not necessarily follow that the unauthorized use of such machine-readable formats by third parties in relation to competing or counterfeit goods or services will not be regarded as a trademark infringement. Here, the question focuses on the third party's "use" of a sign, and there is room for trademark law to be extended incrementally to meet the novel context of machine-readable formats.

In order to determine whether the unauthorized duplication and use of machine-readable formats that embody trademark-specific information amount to a trademark infringement, it is necessary to consult the key ingredients of infringement. In this regard, TRIPS provides that:

> The owner of a registered trademark shall have the exclusive right to prevent all third parties not having the owner's consent from using in the course of trade identical or similar signs for goods or services which are identical or similar to those in respect of which the trademark is registered where such use would result in a likelihood of confusion.[98]

On the basis of the TRIPS provision above, to succeed in an infringement suit, the proprietor of a trademark must establish that a third party, *without having obtained the trademark proprietor's consent,* had, *in the course of trade, made use of a sign* that is *identical or similar to that proprietor's registered trademark* in respect of *identical or similar goods or services* in circumstances where such unauthorized use results in a *likelihood of confusion*. Confusion can be presumed in *double-identity* cases – i.e. where the unauthorized third party's sign is identical to the proprietor's registered mark and is used for identical goods or services.[99]

[98] TRIPS, Art. 16(1) (first sentence). Infringement provisions in trademark statutes and laws around the world are based on this provision.

[99] *Id*. at Art. 16(1) (second sentence).

Accordingly, it becomes clear that a vital ingredient of infringement is the unauthorized third-party's *use* of a sign that is identical or similar to a registered trademark. Furthermore, that use must be *in the course of trade* and *in relation to identical or similar goods or services*. Collectively, these requirements are referred to as the "use requirement". In some jurisdictions, the use requirement is couched in terms of "trademark use". That is, the unauthorized third party must first have made use of a sign "as a trademark".[100] Notably, in the European Union, the CJEU added a further layer to the use requirement when it held that "the use, by a third party, of a sign identical with, or similar to, the proprietor's trade mark implies, at the very least, that *that third party uses the sign in its own commercial communication*" [emphasis added].[101]

Whether or not the hypothetical counterfeiter in our example above has committed an infringement depends on how its conduct satisfies the use requirement set out above. What is notable here is that the counterfeiter has duplicated or copied a QR code, *which is a machine-readable format*. As noted earlier, a QR code (or any other machine-readable format) *as such* is not a "sign", as it is *not capable of being perceived by any of the human senses and is purely functional*. Therefore, it might appear *ex facie* that no infringement has been committed, as the counterfeiter has not used a sign to begin with.

However, by duplicating the QR code and using it for the sale of counterfeit goods, the counterfeiting trader has also effectively made use of the *trademark-specific information* that the QR code embodies. This information incorporates the proprietor's registered trademark. Thus, when the counterfeiting trader duplicates and uses the QR code for its own goods or services, it does, in effect, make use of a sign that is identical (if not similar) to that of the proprietor's mark. However, the trademark-specific information that machine-readable formats embody cannot be perceived by human consumers (unless a machine or device is used). This means that the counterfeiter's use of any *sign* as embodied in the information held by the machine-readable format is not visible to consumers. However, this does not necessarily mean that there is no infringing use of the sign in question. In this regard, it is helpful to refer to judicial decisions in infringement cases involving the use of trademarks as *metatags* and in *keyword advertising*.

Metatags are discrete sections of HTML[102] code embedded in a website in which text can be inserted, setting out keywords and descriptions relevant to the website's contents.[103] Among other things, metatags are used by search engines to prioritize their natural search results.[104] Thus, metatags can provide websites with much-needed visibility on the internet. Ordinarily, metatags do not give rise to trademark-related issues. However, when a website incorporates metatags that are identical or similar to a registered trademark, problems could arise, particularly when the

[100] *See e.g.* Dogan and Lemley (2007), pp. 1675–1682 (providing the history of the doctrine under US trademark law); Psaroudakis (2012), p. 33 (for an explanation of the doctrine's evolution under EU law).

[101] *Google*, [56].

[102] Stands for "HyperText Markup Language", a markup language used in designing websites.

[103] McCarthy (2005), p. 141.

[104] Bouchoux (2018), p. 158.

website does not belong to the registered proprietor of the trademark. Indeed, numerous disputes have arisen between trademark proprietors and owners of third-party websites where the use of metatags corresponding to trademarks has been challenged. Thus, for instance, courts in the United States,[105] Canada,[106] India,[107] and Australia[108] have held that the use of a trademark embedded as a metatag in a website's HTML code could amount to a trademark infringement, which must also mean that such use of trademarks meets the threshold *use* requirement. In the European Union, courts in Austria, Belgium, Denmark, Germany, and Spain have

[105] *See e.g. Brookfield Communications Inc v. West Coast Entertainment Corporation* 74 F.3d 1036 (9th Cir. 1999) ("Using another's trademark in one's metatags is much like posting a sign with another's trademark in front of one's store"); Niton Corporation v. Radiation Monitoring Devices Inc 27 F. Supp. 2d 102 (D. Mass. 1998) (finding that the defendant's act of directly copying the plaintiff's metatags and HTML code on its own website resulted in a diversion of the plaintiff's customers); *Promatek Industries Ltd v. Equitrac Corporation* 300 F.3d 808 (7th Cir. 2002) (holding that the defendant's reference to the plaintiff's trademark in the metatags of the defendant's web page was a violation of trademark law). *North American Medical Corporation v. Axiom Worldwide Inc* Civil Case No 1:06-CV-1678-JTC (N.D. Ga. Apr. 9, 2009) ("Axiom briefly argues that placing a competitor's trademarks within meta tags, which consumers never view, does not constitute a 'use' as required to find trademark infringement under the Lanham Act. However, we readily conclude that the facts of the instant case do involve a 'use' as contemplated in the Lanham Act – that is, a use in connection with the sale or advertisement of goods").

[106] *See e.g. Pandi v. Fieldofwebs.com Ltd* [2007] OJ No 2739 (QL) (the Supreme Court of Ontario recognized that the use of a competitor's trademark in a website's hidden code as metatags could amount to a trademark infringement). *Cf. Red Label Vacations Inc v. 411 Travel Buys Ltd* 2015 FCA 290 (the Canadian Federal Court of Appeal upheld a decision of the Federal Court to the effect that "use of a competitor's trademark or trade name in metatags does not, *by itself*, constitute a basis for a likelihood of confusion, because the consumer is still free to choose and purchase the goods or services from the website he or she initially searched for" (*Red Label Vacations Inc v. 411 Travel Buys Ltd* 2015 FC 18 at [115]). However, the Federal Court of Appeal left open the possibility that use of trademarks in metatags could amount to an infringement when it observed that "in some situations, inserting a registered trade-mark (or trade-mark that is confusing with the registered trade-mark) in a metatag may constitute advertising of services that would give rise to a claim for infringement" 2015 FCA 290 at [22]). *See also* Bowden and Chen (2017), p. 57.

[107] *See e.g. Kapil Wadhwa v. Samsung Electronics Company* 2013(53) PTC 112 (Delhi High Court, Divisional Bench) (although the Divisional Bench rejected the single judge's decision on the legitimacy of parallel imports (i.e. the Divisional Bench held that parallel imports of genuine trademarked goods should be permitted), it affirmed the single judge's order enjoining the appellant from using the respondent's trademark as metatags in the former's website on the basis that it was infringing and did not come within the norms of fair use); *People Interactive (I) Pvt Ltd v. Gaurav Jerry* MIPR 2014 (3) 101 (Bombay High Court) (the Court held that "by illicitly plugging the Plaintiffs' mark and domain name into his website's web pages' meta-tags, the 1st Defendant succeeded in diverting as much as 10.33% and 4.67% of the internet traffic away from the Plaintiffs to himself. There could be no better evidence of passing off, confusion and deception. This is, plainly, hijacking the Plaintiffs' reputation and goodwill and riding piggyback on the Plaintiffs' valuable intellectual property"); *DRS Logistics (P) Ltd v. Google India Pvt Ltd* 2021 (88) PTC 21, [86] ("Having noted the above Judgments, it is clear that the use of the mark as meta-tags was held to be infringement of trademark. It follows, that invisible use of trademark to divert the traffic from proprietors' website to the advertisers'/infringers' website shall amount to use of mark for the purpose of Section 29, which includes Section 29(6) and 29(8), related to advertising").

[108] *See e.g. Accor Australia & New Zealand Hospitality Pty Ltd v. Liv Pty Ltd* [2015] FCA 554, [435] (the defendant's use of the plaintiff's trademarks as metatags in the HTML code of its website was regarded by the Australian Federal Court as amounting to "use as a trademark" for the purposes of infringement). *Cf. Complete Technology Integrations Pty Ltd v. Green Energy Management Solutions Pty Ltd* [2011] FCA 1319.

supported the view that the use of trademarks as metatags can be infringing.[109] At the highest level, the CJEU has had the opportunity to consider whether the term "advertising", as defined in the EU Directive on Misleading and Comparative Advertising,[110] extends to metatags hidden within the internal code of websites. In this regard, the CJEU ruled that:

> it is irrelevant in that regard that the metatags are invisible to the internet user and that they are directly addressed not to that user, but to the search engine. It suffices to note in that regard that, according to those provisions, the concept of advertising expressly encompasses any form of *representation*, and therefore including indirect forms of representation, *particularly where they are capable of influencing the economic behaviour of consumers and, therefore, of affecting the competitor whose name or goods are referred to by the metatags*. [emphasis added][111]

The Court also observed that "[t]here is, moreover, no doubt that such use of metatags is a promotion strategy in that it aims to encourage the internet user to visit the site of the metatag user and to take an interest in its goods or services".[112] Accordingly, the CJEU concluded that metatags amounted to a "representation" within the meaning of the term "advertising". The CJEU's observations indicate that the *lack of visibility* of metatags will not prevent a finding that they are representations capable of influencing the economic behaviour of consumers. On that logic, it may be argued that when signs identical or similar to trademarks are embedded in the metatags of websites, their lack of visibility to the consumer alone cannot be used as a ground to deny an infringement claim. While this point of view finds support in academic commentaries,[113] it has also been opposed.[114] However,

[109] *See* Thornton (2014), pp. 500–502.

[110] *See* Directive 2006/114/EC of the European Parliament and of the Council of 12 December 2006 concerning misleading and comparative advertising (codified version), Art. 2(a) (this EU directive repealed and replaced Council Directive 84/450/EEC of 10 September 1984 relating to the approximation of the laws, regulations and administrative provisions of the Member States concerning misleading advertising, which applied before).

[111] Case C-657/11, *Belgian Electronic Sorting Technology NV v. Bert Peelaers* [2013] ETMR 45, [58].

[112] *Id.* at [59].

[113] *See e.g.* Posner (2000), p. 505 ("Thus, this Note concludes that trademark infringement, via initial interest confusion, offers the best doctrinal fit to the problem of manipulative metatagging and it urges all federal courts to follow the *Brookfield* court's approach"); Paylago (2000), p. 470 ("Metatags are employed for the sole purpose of attracting potential customers to a web site. Therefore, the improper use of another's trademarks in a site's metatags amounts to a purposeful action to misdirect customers and generate pre-sale confusion. Because pre-sale confusion is not tolerated in typical business settings, it should not be tolerated on the internet. Consequently, courts should apply a pre-sale confusion doctrine to provide trademark holders an avenue of relief in the internet medium").

[114] *See e.g.* Widmaier (2004), p. 708 ("There ought to be no liability for invisible keyword and metatag use of another's trademarks"); McCarthy (2005), p. 156 ("In a time of increasing scope of intellectual property rights protection, consumers must assert their right to use the tools of modern marketing (namely, trademarks) in a way that allows them more flexibility, not less. At the same time, those who have developed powerful trademarks should not be allowed to use trademark law to foreclose online competition"); Llewelyn and Reddy (2020), p. 425 ("even if policy makers feel tempted to tackle these issues, it is preferable to do so under a general advertising law rather than a law as specialized (and specific) as trade mark law").

courts across many jurisdictions have made it clear that the invisibility of metatags will not generally defeat the use requirement under trademark law.

The series of keyword advertising cases further strengthens the proposition that invisible uses of trademarks are not excluded from the scope of infringement merely because of their lack of visibility. Keyword advertising refers to the practice of utilising keywords to trigger advertisements or sponsored links that target users of search engines. Popular search engines, including Google, offer this service. This is not a controversial practice. However, just as with metatags, disputes can occur when a third party uses a sign identical to a trademark as a keyword when advertising competing goods or services.[115] As such, it is not surprising that the practice of keyword advertising has been challenged by trademark proprietors in lawsuits filed around the world. In all of these cases, a key question that occupied the minds of judges was whether the selection and use of trademarks as keywords, *which is a purely internal matter between the advertiser and the search engine*, satisfied the use requirement for the purposes of establishing an infringement. While a small number of courts have responded in the negative,[116] courts in the United States,[117] the United Kingdom,[118] the European Union,[119] and India[120] have responded in the affirmative. Since the use of trademarks in the selection of keywords and the triggering of advertisements *is not visible to consumers* (i.e. users of search engines), the keyword advertising cases make it clear that visibility is not a prerequisite for the use requirement under trademark law.

The discussion on metatags and keyword advertising demonstrates that "invisible" uses made of trademarks by unauthorized third parties are not shielded from liability under trademark law on that ground alone. The metatag and keyword advertising case precedents can be extended incrementally and by analogy to the use of trademarks in machine-readable formats. After all, any use made of trademarks in machine-readable formats is invisible (cannot be directly perceived by humans), just as it is when trademarks are used as metatags or keywords to trigger advertisements

[115] *See* Kilejian and Dahlstrom (2016), pp. 123–124.

[116] For instance, the Australian Federal Court in *Veda Advantage Limited v. Malouf Group Enterprises Pty Limited* [2016] FCA 255 held that advertisers merely selected keywords to provide the search engine, and that this did not indicate a connection in the course of trade between their goods or services and those of others, as any use of the keyword was completely invisible to consumers (at [123]).

[117] *See e.g. Rescuecom Corp v. Google Inc* 562 F.3d 123 (2d Cir. 2009) (The Court held that Google's acts of selling keywords that resembled the plaintiff's trademarks was a use in commerce); *Rosetta Stone Ltd v. Google Inc* 676 F.3d 144 (2012) (Google admitted and the Court assumed that Google's use of Rosetta Stone's trademarks as part of its advertising programme was a use in commerce under the US Lanham Act).

[118] *See e.g. Cosmetic Warriors Ltd v. Amazon.co.uk Ltd* [2014] EWHC 181 (Ch) (The Court found that Amazon infringed the plaintiff's LUSH trademark by bidding on the Google keyword "lush" so that consumers who searched for "lush" on Google would be shown advertisements that related to Amazon's own products and other third-party products sold on its platform).

[119] *See e.g. Google*, [73] ("It follows from all of the foregoing that use by an advertiser of a sign identical with a trade mark as a keyword in the context of an internet referencing service falls within the concept of use 'in relation to goods or services' within the meaning of Article 5(1)(a) of Directive 89/104").

[120] *See e.g. DRS Logistics (P) Ltd v. Google India Pvt Ltd* 2021 (88) PTC 21 (where the Delhi High Court held that the use of a trademark as a keyword in the context of Google's advertising programme amounted to an infringement although such use was not visible to users of the search engine).

on search engines. Therefore, it is possible that the unauthorized duplication and use of machine-readable formats that digitally embody trademarks can amount to trademark infringement despite the "information" that such machine-readable formats hold being "invisible" to human consumers. However, much would depend on the nature of the use made. For instance, trademark law should not prevent a trader from incorporating trademarks into a QR code if the objective of doing so is to inform consumers of the various *genuine* products that the trader sells as a second-hand seller or parallel importer (*where such parallel imports are lawful*). In contrast, where an invidious trader incorporates a trademark into his QR code, as in the hypothetical example that we have set out, to pass off counterfeit goods as genuine branded items, the aggrieved trademark proprietor should have a remedy under trademark law. In this regard, it is necessary to take the view that incorporating trademark-specific information into machine-readable formats satisfies the threshold use requirement, which is a key ingredient for establishing infringement. Indeed, when human consumers begin to employ interconnected and intelligent devices and machines to make purchasing decisions on their behalf, such devices and machines will directly interact with machine-readable formats that incorporate trademarks. To cater to this future, there is a need to ensure that trademark law can capture the "invisible" use of signs in machine-readable formats to guarantee that such formats are not used in ways that infringe the rights of trademark proprietors.

But any prospect of success in a trademark infringement suit depends on a *likelihood of confusion* being established on the part of *human* consumers. Even if it can be said that the use of trademarks in machine-readable formats amounts to use in a trademark sense, unless such use is likely to cause confusion, infringement cannot be established (unless, of course, it is a case of "double identity", where confusion can be presumed). As such, it is necessary to consider how the requirement of confusion applies to a world where humans begin to employ devices and machines to assist or replace them in the process of making purchasing decisions.

3.3 "Machine" Confusion?

Confusion is unfavourable to efficient markets. It increases consumer search costs.[121] Trademarks seek to eliminate confusion. Therefore, it is unsurprising that the concept of confusion is deeply entrenched in trademark law. And so, both when granting trademark rights and when determining infringements, intellectual property offices and courts have long employed the test of confusion. In the context of trademark registration, signs that are identical or confusingly similar to existing trademarks are disqualified, as granting protection to such signs would increase confusion in the market. Similarly, when an unauthorized third party makes use of a sign that is identical or similar to a registered trademark in a manner that is likely to cause confusion, such use must be prohibited to promote efficiency in the market.

But *how* do we assess confusion? And, more importantly, *who* must be confused? These are questions that are worth considering in light of the *machine-dominated*

[121] *See e.g.* Dogan and Lemley (2004), pp. 786–787.

future contemplated by this paper. Interestingly, when TRIPS defines the rights of registered trademark proprietors, it provides that right holders can prevent the unauthorized use of their registered trademarks "where such use would result in a likelihood of confusion".[122] The provision in TRIPS does not explicitly tell us who must be confused – it merely provides that the unauthorized third-party's use of a registered trademark must result in a likelihood of confusion for such use to be prohibited by law. However, when we consult the body of case law emerging from national courts and the CJEU's jurisprudence in the context of the European Union, it becomes patently clear that confusion is assessed from the perspective of *human* consumers. This has implications for how we measure confusion in situations where humans begin to use interconnected and intelligent devices and machines to assist them with or replace them in making purchasing decisions.

In the European Union, the likelihood of confusion is determined through a *global assessment* that considers several relevant factors. The CJEU has made this clear when it ruled that the appreciation of the likelihood of confusion depends on "numerous elements and, in particular, on the recognition of the trade mark on the market, of the association which can be made with the used or registered sign, of the degree of similarity between the trade mark and the sign and between the goods or services identified".[123] The determination of confusion is interdependent on the relevant factors, particularly the similarity between the trademarks under scrutiny and the degree of similarity in the competing goods.[124] A lesser degree of similarity between the competing goods or services may be offset by a greater degree of similarity between the competing trademarks and *vice versa*.[125] The similarity between two trademarks is determined on the basis of their *visual, aural* and *conceptual* similarity.[126] The global appreciation of the visual, aural or conceptual similarity of the trademarks under comparison "must be based on the overall impression given by the marks, bearing in mind, in particular, their *distinctive and dominant components*" [emphasis added].[127] It is argued that consumers rarely have the opportunity to compare trademarks in the market directly, side by side, and must rely on their *imperfect recollection*, which is limited to the most dominant and distinctive elements of a trademark.[128] Significantly, the global assessment of confusion is determined

[122] TRIPS, Art. 16(1).

[123] Case C-251/95, *SABEL BV v. Puma AG, Rudolf Dassler Sport* [1997] ECR I-06191 (*SABEL*), [22]. *See also*, C-39/97, *Canon Kabushiki Kaisha v. Metro-Goldwyn-Mayer Inc* [1998] ECR I-05507 (*Canon*), [16]; Case C-342/97, *Lloyd Schuhfabrik Meyer & Co. GmbH v. Klijsen Handel BV* [1999] ECR I-03819 (*Lloyd*), [18]; Case C-425/98, *Marca Mode CV v. Adidas AG and Adidas Benelux BV* [2000] I-04861 (*Marca Mode*), [40]; Case C-120/04, *Medion AG v. Thomson multimedia Sales Germany & Austria GmbH* [2005] ECR I-08551 (*Medion*), [27].

[124] *SABEL*, [22]; *Canon*, [17]; *Lloyd*, [19]; *Marca Mode*, [40].

[125] *Canon*, [17]; *Lloyd*, [19]; *Marca Mode*, [40].

[126] *SABEL*, [23]; *Lloyd*, [19]; *Medion*, [28].

[127] *SABEL*, [23]; *Lloyd*, [25]; *Medion*, [28].

[128] *Lloyd*, [25]. *See also* Case T-297/18, *Wirecard Technologies GmbH v. European Union Intellectual Property Office (EUIPO)* ECLI:EU:T:2019:160, Case T-443/12, *Equinix (Germany) GmbH v. OHIM* ECLI:EU:T:2013:605, [54]; Case T-700/18, *Kalypso Media Group GmbH v. European Union Intellectual Property Office (EUIPO)* ECLI:EU:T:2019:739, [45].

from the perspective of the *average consumer* of the type of goods or services in question.[129] The average consumer is one who is "reasonably well informed" and "reasonably observant and circumspect".[130] In the context of the internet, it is a consumer who is "normally informed and reasonably attentive".[131]

In the United States, a number of tests have been formulated by the federal circuit courts comprising multiple factors to assess the incidence of confusion in trademark infringement cases. For instance, the courts in the Second Circuit employ the factors formulated in *Polaroid v. Polarad*,[132] commonly known as the *Polaroid test*, while the courts in the Third Circuit apply the *Lapp test*, formulated in *Interpace v. Lapp*.[133] Although the factors detailed in these tests and their phrasing vary, they tend to commonly include the following factors – the strength of the registered trademark; the similarity between the trademarks under comparison; the type of goods involved or the proximity of the products; the degree of care likely to be exercised by the purchaser or the sophistication of the consumers; and evidence of actual confusion. These factors share some common elements with the global appreciation standard employed in the European Union. For instance, when comparing two trademarks, the question posed under US law is not whether they can be distinguished when compared side by side, but rather, when they are compared overall, whether they are sufficiently similar that there is a likelihood of confusion as to the source of the goods or services.[134] When comparing trademarks, "[a]ll relevant facts pertaining to appearance, sound, and connotation must be considered before similarity as to one or more of those factors may be sufficient to support a finding that the marks are similar or dissimilar".[135] The "sight, sound and meaning" analysis is comparable to the assessment of visual, aural and conceptual similarity between trademarks under EU trademark law.[136] Importantly, when evaluating similarities between trademarks, emphasis is placed on the recollection of the *average consumer* who typically retains a general, and not a specific, impression of trademarks.[137]

But can a test that is centred around the average *human* consumer be applied to situations of confusion with regard to origin that might arise when machines assist or replace humans in making purchasing decisions? Unless the likelihood of confusion test is calibrated suitably, it will not be possible to extend its application

[129] *SABEL*, [23].

[130] *Lloyd*, [26].

[131] *Google*, [84]; Case C-278/08, *Die BergSpechte Outdoor Reisen und Alpinschule Edi Koblmüller GmbH v. Günther Guni and trekking.at Reisen GmbH* [2010] ECR I-02517, [36]; Case C-558/08, *Portakabin Ltd and Portakabin BV v. Primakabin BV* [2010] I-06963, [35].

[132] *Polaroid Corp v. Polarad Electronics Corp* 287 F.2d 492, 495 (2d Cir.1961).

[133] *Interpace Corp v. Lapp Inc* 721 F.2d 460 (3d Cir. 1983).

[134] *See e.g. Midwestern Pet Foods Inc v. Societe Des Produits Nestle S.A.* 685 F3d 1046, 1053, 103 USPQ2d 1435, 1440 (Fed. Cir. 2012); *Edom Labs Inc v. Lichter* 102 USPQ2d 1546, 1551 (TTAB 2012); *In re Iolo Techs* LLC 95 USPQ2d 1498, 1499 (TTAB 2010).

[135] *Recot Inc v. MC Becton* 214 F.3d 1322, 1329, 54 USPQ2d 1894, 1899 (Fed. Cir. 2000).

[136] Gangjee (2022), p. 9.

[137] *In re Cynosure Inc* 90 USPQ2d 1644, 1645 (TTAB 2009).

to novel forms of confusion that may arise in a machine-dominated world. We set out a few areas where adjustments may be required.

First, trademark law presumes confusion in *double-identity* cases (i.e. where an unauthorized third party makes use of an *identical sign* for *identical goods or services*). In such cases, the risk of confusion is deemed so obvious (*to humans, of course!*) that it can be presumed.[138] However, can we say the same when interconnected and intelligent devices and machines make purchasing decisions on behalf of their human principals? Will AI systems be as gullible as humans? Grynberg does not seem to think so, as is evident from the following observation that appears in his work:

> Can it be confused or gamed? We can imagine a range of possibilities here including, at the far end, the prospect of an "omniscient" AI that cannot be misdirected by a false use of a trademark. But even short of that, we might picture lesser Ads with superhuman resistance to deception. An Al that outperforms humans generally may still deliver the occasional "wrong" result due to external manipulation, but its capacity to learn should make these errors unlikely to recur.[139]

As we have noted earlier in this paper, given the capability of AI to make use of a multitude of factors when making purchasing decisions, it is likely that machines will not be as vulnerable as humans in double-identity cases. If so, there may be no need for a presumption of likelihood of confusion.

Second, adjustments will be required as to *how* confusion, and particularly how similarity between trademarks, is assessed. As we noted before, the use of AI assistants (such as Alexa) is on the rise, and this is already altering how humans interact with trademarks. Here, the consumer is *assisted* by smart devices and intelligent AI algorithms in making purchasing decisions, although the consumer retains control over the final choice. Given that consumers are more likely to interact with AI assistants using their voice, there may be a need to place greater emphasis on the *phonetic* or *aural* similarity between trademarks as opposed to their visual or conceptual similarity.[140]

And moving beyond AI assistants to a future where humans fully automate the process of product purchasing and divest their discretion to machines, further adjustments to the confusion test will be required. In this regard, Curtis and Platts have pointed out that "when AI is the consumer" (which is a strange proposition because an artificial construct cannot truly "consume"), the AI will not suffer from human "faults".[141] Thus, unlike the average consumer, the legal fiction[142] fundamental to the analysis of the likelihood of confusion,[143] machines will not suffer from defects such as *imperfect recollection*. This means that, when presented

[138] Senftleben (2013), pp. 138–139.

[139] Grynberg (2019), pp. 204–205.

[140] Gangjee (2022), p. 4.

[141] Curtis and Platts (2017), p. 12.

[142] Laustsen (2020), p. 6.

[143] Bently et al (2018), p. 1043.

with similar trademarks, machines will be capable of spotting even minute differences. That is to say, the comparison will not be limited to the distinctive and dominant elements of the marks being compared. The upshot of all this is that, unlike humans, machines will not easily be confused.[144] This will make it necessary to heighten the standard for assessing the likelihood of confusion.

Third, adjustments will have to be made to the central focus of the analysis of the likelihood of confusion – the average consumer. As noted above, when machines *assist* humans in their purchasing decisions, the average consumer will not be one who is "reasonably well informed" and "reasonably observant and circumspect". The consumer will be *better informed*, *fully observant* and less susceptible to deception and confusion. However, when humans are replaced by machines in the process of making purchasing decisions, the law will no longer be able to rely on the notion of an average consumer, as humans will not be involved at the point of purchase. For instance, in the hypothetical example we set out earlier in this paper,[145] when an AI system is misled by a duplicate QR code and ends up purchasing a counterfeit product assuming it to be genuine, there is only machine confusion *at the point of purchase*. Any *human* consumer confusion takes place afterwards when the product is delivered. Thus, if we are to find an infringement in the hypothetical example, it can only be on the basis of *post-sale confusion*.[146] But the assessment of post-sale confusion has conventionally focused on "observers of the goods that are already purchased and in use".[147] This means that the test for post-sale confusion does not assist in determining confusion among actual purchasers of products.[148] Also, the post-sale confusion doctrine may not necessarily apply to *services*, which, unlike goods, may not be readily observable by the general public. As such, there may be a need to tweak the post-sale confusion test to include not only the general public who might observe a product in use but also the actual purchaser of the product (who had employed a device or machine to make the purchasing decision). Alternatively, trademark law may need to shift from requiring *human* confusion at the point of purchase and be willing to embrace the notion of *machine confusion*. But such radical changes to trademark doctrine will only happen incrementally and with time,[149] when humans slowly but surely disappear at the point of purchase (as we contemplate in this paper!).

[144] Curtis and Platts (2019), p. 45.

[145] *See* discussion above under *"Signs" Beyond Human Perception*.

[146] McCarthy (1999), p. 3338 (discussing the position under US trademark law); Morris (2012), pp. 60–61 (discussing the position under EU trademark law).

[147] Leaffer (2006), p. 128 (for the US perspective); Dutfield and Suthersanen (2020), p. 215 (for the EU perspective).

[148] Dornis (2017), p. 354.

[149] Batty (2022), p. 162.

4 Conclusion

The central argument of this paper is that advancements in AI, IoT, and blockchain technology present a unique challenge to our conventional understanding of trademark law. This challenge arises from the potential displacement of human consumers by machines at the point of purchase, leading to conflicts between preserving existing trademark doctrines and adapting to technological advancements. Our primary assertion is that current trademark law is inadequately equipped to handle this shift.

Interconnected and intelligent machines and devices will assist, if not replace, humans in critical areas of decision-making. The retail sector will not be immune to this shift. It is only a matter of time. And when this happens, trademarks, their proprietors, and the law governing their protection will have to respond. In this paper, we have made a modest attempt to reflect on how developments in AI, IoT, and blockchain technology are likely to impact trademarks and their role in commerce. In particular, we noted that adapting our current understanding of trademark law to a world dominated by machines is anything but straightforward. The *human* consumer is a critical component of trademark doctrine. It is not possible to easily remove the human from trademark law without the latter crumbling and breaking down into incoherence. Thus, it may be best not to do so.

Instead, policymakers should think "outside the box". Digitizing trademarks, by transforming them into machine-readable formats and storing them on the blockchain, enables both consumers and machines of the future to verify the authenticity and provenance of products. This process closely aligns with the concept of "Technology Protection Measures" or TPMs.[150] And when a deceitful trader duplicates, manipulates and applies a digital or smart trademark for third-party goods or services, including the sale of counterfeits, such acts closely resemble the circumvention of a TPM. So far, copyright law has dominated the discourse on TPMs. Perhaps it is time to alter the *status quo* and think about TPMs for trademarks. This would empower trademark proprietors to specifically address unauthorized acts of duplication, circumvention, and misleading use of their digital/smart trademarks in machine-readable formats without having to rely on conventional approaches to trademark law. This approach directly addresses the need for a more technologically adaptive trademark law. We bring our discussion to an end by urging and encouraging further research into TPMs and trademarks so that trademark law can be developed to address technological developments more directly.

[150] Drawing inspiration from copyright statutes, we provide the following generic definition for a TPM: "A technology protection measure is a device or product, or a component incorporated into a process, that is designed in the ordinary course of its operation, to prevent or inhibit the infringement of trademark rights".

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