Trade Marks and the Third Dimension

Implications of 3D Printing in the Likelihood of Confusion of Three-Dimensional Trade Marks

University of Helsinki
Faculty of Law
Master's Thesis
Intellectual Property Law
Author: Atte Andersin
Supervisor: Prof. Taina Pihlajarinne

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

Tiedekunta/Osasto Fakultet/Sektion – Faculty	Laitos/Institution– Department	
Faculty of law		
Tekijä/Författare – Author		
Atte Andersin		
Työn nimi / Arbetets titel – Title		
Trade Marks and the Third Dimension: Implications of 3D Printing in the Likelihood of Confusion of Three-Dimensional Trade Marks		
Oppiaine /Läroämne – Subject		
Intellectual Property Law		
Työn laji/Arbetets art – Level	Aika/Datum – Month and year	Sivumäärä/ Sidoantal – Number of pages
Master's Thesis	April 2017	XXV + 81

Tiivistelmä/Referat – Abstract

Likelihood of confusion in trade mark law protects the proprietor of the earlier trade mark from the use of similar marks in the course of trade in situations, where the similarity of the marks is likely to induce confusion as to the origin of the goods or services in the eyes of the relevant public. Assessment of likelihood of confusion and criteria related thereto are notably complicated and ambiguous due to the wide wording of the relevant provisions and incoherent legal praxis. This treatise inspects the concept of likelihood of confusion in the context of three-dimensional trade marks and 3D printing. The research systematises the assessment of likelihood of confusion in a digital context and identifies the special problems in the legal evaluation emanating from the new technology. Questions are assessed mainly from the point of view of a trade mark proprietor.

Despite the main rule of trade mark law being similar assessment of all different types of trade marks employing similar criteria, certain special characteristics and requirements are imposed on shape marks, such as the assessment of sufficient distinctive character in accordance with the Henkel test. Distinctive character possesses notable importance in relation to likelihood of confusion, since e.g. a high level of distinctiveness of the earlier mark has been found to increase the possibility of finding likelihood of confusion to some extent. Situations of likelihood of confusion are divided into relative grounds for refusal or invalidity and uses within the scope of the exclusive right of the proprietor. Additionally, protection can be claimed in three different forms according to how likelihood of confusion is understood in the situations. These forms encompass protection against identical marks in the same goods or services where likelihood of confusion is presumed, protection against identical or similar marks in the same or similar goods or services, i.e. the core of likelihood of confusion as well as extended protection of marks with a reputation, where likelihood of confusion is usually claimed but not required in order to afford protection. Furthermore, since 3D printing is based on a so-called CAD file, the assessment needs to consider the both levels of digital files and physical printed objects. Especially the legal position of digital CAD files in trade mark law is ambiguous and the circumstances relevant to the assessment differ from the physical world.

In the technical sense 3D printing is a relatively new method of production, where a physical item can be created by using a digital blueprint, i.e. a CAD file, layer upon layer. Owing to the process, the printed objects possess certain characteristics in relation to appearance and functionality, such as a layered and monochromatic surface, depending on the material used, printing method and level of sophistication of the printer itself. On the other hand, the technology enables the effortless creation of extremely complicated structures, combining internal movable parts and structures as a single print without the need for a separate assembly and endless possibilities for customisation of an existing product. Also the cost per unit of printed items is not dependent on the amount of units produced, but the economics of scale of 3D printing result in a constant cost per unit, thus differing significantly from traditional mass manufacturing. The market of consumer 3D printing is emerging rapidly, largely due to significant decrease in printer and raw material prices, which is likely to result in an exponential growth in possible trade mark related problems due to the disruptive nature of the technology. The technology also enables manufacturing away from control, which means that proprietors of trade mark rights will need to adapt their enforcement strategies accordingly.

The research identifies the criteria that need to be considered when assessing likelihood of confusion in connection with 3D printing. Besides the obvious benchmarks in relation to assessing the similarity of the signs, the criteria encompasses the special characteristics in assessing similarity of the goods or services and determining the relevant public. Even though 3D printing is unlikely to significantly affect the main process of assessment of likelihood of confusion, the research points out certain factors that are in need of clarification by case law or the legislature in order to enhance legal certainty and promote innovation and emerging business models, in both 3D printing and other fields of business. Additionally, since 3D printing is likely to diminish the inherent value of trade marks, the increasing pressure for legislative reform diminishing the negative effects of artificial scarcity created by trade mark enforcement and facilitating brand creation, e.g. by shifting the emphasis on protection the additional functions of trade marks is discussed.

Avainsanat – Nyckelord – Keywords

Trade Mark, Likelihood of Confusion, 3D Printing, Trade Mark Directive, Trade Mark Regulation, Distinctive Character

Säilytyspaikka – Förvaringställe – Where deposited

Helsinki University Library

Muita tietoja – Övriga uppgifter – Additional information

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

Tiedekunta/Osasto Fakultet/Sektion – Faculty	Laitos/Institution– Department	
Oikeustieteellinen tiedekunta		
Tekijä/Författare – Author		
Atte Andersin		
Työn nimi / Arbetets titel – Title		
Tavaramerkit ja kolmas ulottuvuus: 3D tulostamisen merkitys kolmiulotteisten tavaramerkkien sekaannusvaaran kannalta		
Oppiaine /Läroämne – Subject		
Immateriaalioikeus		
Työn laji/Arbetets art – Level	Aika/Datum – Month and year	Sivumäärä/ Sidoantal – Number of pages
OTM-tutkielma	Huhtikuu 2017	XXV + 81

Tiivistelmä/Referat – Abstract

Tavaramerkkioikeudellinen sekaannusvaara suojaa aikaisemman tavaramerkkioikeuden haltijaa samankaltaisten tunnusmerkkien käyttämiseltä taloudellisessa toiminnassa tilanteissa, joissa tunnusmerkkien samankaltaisuus johtaa riskiin tuotteiden tai palveluiden sekoittumisesta kohderyhmän silmissä. Sekaannusvaaran arviointi ja siihen liittyvät kriteerit ovat monessa mielessä monimutkaisia ja epäselviä lavean ja yleisluonteisen lainsäädännön sekä epäjohdonmukaisen oikeuskäytännön johdosta. Tutkielmassa käsitellään sekaannusvaaran käsitettä kolmiulotteisten tavaramerkkien ja 3D tulostamisen kontekstissa. Tutkielma pyrkii systematisoimaan sekaannusvaaran arviointia digitaalisessa kontekstissa ja tunnistamaan erityiset ongelmakohdat, joita uusi teknologia aiheuttaa oikeudellisessa arvioinnissa. Kysymyksiä tarkastellaan pääosin aikaisemman tavaramerkkioikeuden haltijan näkökulmasta.

Vaikka tavaramerkkioikeuden pääsääntönä on kaikkien tavaramerkkityyppien arviointi yhtenevien kriteerien pohjalta, kolmiulotteisen tavaramerkin rekisteröimiseen liittyy tiettyjä erityiskysymyksiä ja edellytyksiä, kuten erottamiskyvyn arviointi ns. Henkel-testin mukaan. Erottamiskyvyllä on huomattava merkitys sekaannusvaaran kannalta, sillä esimerkiksi aikaisemman tavaramerkin vahvan erottamiskyvyn on katsottu lisäävän sekaannusvaaran mahdollisuutta. Sekaannusvaaran käsittävät tilanteet on jaoteltu ensinnäkin suhteellisiin rekisteröimisesteisiin sekä yksinoikeuden alaan kuuluviin tunnusmerkin käyttöä koskeviin tilanteisiin. Tämän lisäksi suoja-ala on jaoteltu kolmeen eri luokkaan sen mukaan, miten sekaannusvaara ilmenee tilanteissa, eli identtisyyssuojaan jossa sekaannusvaara on oletettu, suojaan samankaltaisia tunnusmerkkejä vastaan eli varsinaiseen sekaannusvaaraan sekä laajalti tunnettujen tavaramerkkien laajennettuun suojaan, jossa sekaannusvaaran olemassaoloa yleensä esitetään mutta ei edellytetä suojan saamiseksi. Lisäksi 3D tulostamisen perustuessa ns. CAD-tiedostoon, tulee tarkastelussa tiedostaa jaottelu digitaalisten tiedostojen ja fyysisten tulostettujen esineiden osalta kahdelle eri tasolle. Varsinkin digitaalisten CAD-tiedostojen oikeudellinen asema tavaramerkkioikeudessa on epäselvä ja tarkastelussa huomioitavat seikat eroavat perinteisestä analogisesta kontekstista.

Teknisessä mielessä 3D tulostaminen on suhteellisen uusi valmistusmenetelmä, jossa digitaalista CAD-tiedostoa hyödyntämällä voidaan tulostaa fyysinen esine kerros kerrokselta. Valmistustavasta johtuen tulostetut tuotteet omaavat tiettyjä ulkoisia ja toiminnallisia ominaisuuksia kuten kerroksittainen pintakuviointi sekä yksivärisyys, käytetystä materiaalista, tulostustekniikasta sekä tulostimen tasosta riippuen. Toisaalta tekniikka mahdollistaa jo nykyisellään erittäin monimutkaisten rakenteiden vaivattoman tuottamisen, liikkuvien osien ja rakenteiden tulostamisen yhtenä kokonaisuutena ilman erillisen kasaamisen tarvetta sekä yksittäisen tuotteen loputtoman muokkaamisen. Valmistustavasta johtuen myös valmistettavien esineiden tuotantokustannukset eivät riipu valmistettavien esineiden määrästä vaan pysyvät vakiona, eroten huomattavasti perinteisestä massatuotantomallista. Valmistusmenetelmä on tulostimien ja raaka-aineiden hintojen laskun ansiosta saavuttamassa kuluttajamarkkinat, mikä tulee johtamaan mahdollisten tavaramerkkioikeudellisten ongelmien eksponentiaaliseen kasvuun teknologian disruptiivisesta luonteesta johtuen. Teknologia mahdollistaa myös tuotteiden valmistamisen perinteisen kontrollin ulkopuolella, mistä johtuen tavaramerkkien haltijoiden on mukautettava strategioitaan oikeuksiensa valvonnassa.

Tutkielman johtopäätöksenä on tunnistettu kriteerit, joihin kolmiulotteisten tavaramerkkien osalta on kiinnitettävä erityistä huomiota sekaannusvaaran arvioinnissa 3D tulostamisen yhteydessä. Kriteeristö kattaa itse tavaramerkkien samankaltaisuuden arvioimisen ohella muun muassa relevantin yleisön sekä tavaramerkkiä koskevien tavaroiden tai palveluiden määrittelemiseen liittyviä erityispiirteitä. Vaikka 3D tulostaminen ei todennäköisesti tule muuttamaan merkittävästi itse sekaannusvaaran arviointiprosessia, tutkimuksessa on eroteltu seikkoja, joita tulevaisuuden oikeuskäytännön tai lainsäädännön olisi syytä selkeyttää oikeusvarmuuden parantamiseksi sekä innovaatioiden ja uusien liiketoimintamallien toimintaedellytysten edistämiseksi niin 3D tulostamisen kuin muidenkin toimialojen osalta. Lisäksi, koska 3D tulostamisen on esitetty vähentävän tavaramerkkien itseisarvoa, tutkimuksessa tarkastellaan lyhyesti kasvavia paineita lainsäädännöllisiin uudistuksiin, joilla tavaramerkeillä saavutettavan keinotekoisen niukkuuden negatiivisia vaikutuksia vähennettäisiin ja brändien rakentamista helpotettaisiin, esimerkiksi lisäämällä tavaramerkkien muiden funktioiden kuin alkuperäfunktion merkitystä suoja-alan määrittämisessä.

Avainsanat – Nyckelord – Keywords

Tavaramerkki, Sekaannusvaara, 3D tulostaminen, Tavaramerkkidirektiivi, Tavaramerkkiasetus, Erottamiskyky

Säilytyspaikka – Förvaringställe – Where deposited

Helsingin yliopiston kirjasto

Muita tietoja – Övriga uppgifter – Additional information

TABLE OF CONTENTS

BIBLIOGRAPHY

Authoritative Sources

EUIPO Guidelines for Examination of EU Trade Marks 2017

European Union Intellectual Property Office: Guidelines for Examination of European Union Trade Marks, Version 1.0, 1 February 2017.

Finnish Government Bill HE 24/2016 vp

Finnish Government Bill for the Parliament on the amendment of the Trademarks Act and Chapter 49 Section 2 of the Criminal Code 24/2016 (Hallituksen esitys Eduskunnalle laiksi tavaramerkkilain ja rikoslain 49 luvun 2 §:n muuttamisesta HE 24/2016 vp).

Memorandum of the Finnish Ministry of Economic Affairs and Employment 2012

Finnish Ministry of Economic Affairs and Employment: Memorandum of the Reform of the Trademarks Act, Employment and Entrepreneurship 38/2012 (Muistio tavaramerkkilain uudistamisesta, Työ ja yrittäjyys 38/2012).

Swedish Government Bill SOU 1958:10

Swedish Government Bill for a Trade Mark Act: Report of a Committee on Trade Mark and Company Matters, SOU 1958:10, Department of Justice, Stockholm, 24 April 1958.

UK Intellectual Property Office 2016

Intellectual Property Office of the United Kingdom: Trade Marks Manual, 2016.

Literature

Barnatt 2016

Barnatt, C.: *3D Printing*: Third Edition, Explainingthefuture.com, 2016.

Cornish – Llewelyn – Aplin 2013

Cornish, W. R. – Llewelyn, D. – Aplin, T.: *Patents, Copyright, Trade Marks and Allied Rights*, Eight Edition, Sweet & Maxwell, 2013.

Davis et al 2014

Davis, R. – Longstaff B. – Roughton, A. – St Quintin, T. – Tritton, G.: *Tritton on Intellectual Property in Europe*, Fourth Edition, Sweet & Maxwell, 2014.

Drockila 1986

Drockila, L.: *Tavaramerkkien sekoitettavuudesta ja harhaanjohtavuudesta*, Lakimiesliiton kustannus, 1986.

Evans 2012

Evans, B.: *Practical 3D Printers: The Science and Art of 3D Printing*, New York: Apress, 2012.

Griffiths – McDonagh 2013

Griffiths, G. and McDonagh, L.: 'Fundamental rights and European IP law: the case of art 17(2) of the EU Charter', in Geiger, C. (ed.): *Constructing European Intellectual Property: Achievements and New Perspectives*, pp. 75–93, Cheltenham, UK and Northampton, MA, USA, Edward Elgar Publishing, 2013.

Haarmann 2014

Haarmann, P.: *Immateriaalioikeus*, Fifth Edition, Talentum Media Oy, 2014.

Jehoram – Van Nispen – Huydecoper 2010

Jehoram, T. C. – Van Nispen, C. J. – Huydecoper, T.: *European Trademark Law: Community Trademark Law and Harmonized National Trademark Law*, Kluwer Law International, 2010.

Kukkonen 2010

Kukkonen, K.: 'Ulkoasumerkin erottamiskyvyn arviointi', in T. Pihlajarinne – E. Pokela – K. Ruuhonen (ed.): *Tavaramerkki ja toiminimi - immateriaalioikeudellisia erityiskysymyksiä*, pp. 217–235, Lakimiesliiton kustannus, 2010.

Landes – Posner 2003

Landes, W. M. and Posner, R. A.: *The Economic Structure of Intellectual Property Law*, The Belknap Press of Harvard University Press, 2003.

Larson 2013

Larson, J.: *3D Printing Blueprints: Design Successful Models for Home 3D Printing, Using a Makerbot or Other 3D Printers*, Packt Publishing, 2013.

Lipson – Kurman 2013

Lipson, H. and Kurman, M.: *Fabricated: The New World of 3D Printing*, John Wiley & Sons, Incorporated, 2013. ProQuest Ebook Central, retrieved from

<http://ebookcentral.proquest.com.libproxy.helsinki.fi/lib/helsinki-ebooks/detail.action?docID=947565>.

Moore 2001

Moore, G. A.: *Crossing the Chasm: Marketing and Selling High-Tech Products to Mainstream Customers*, Revised Edition, HarperCollins Publishers, 2001. Retrieved from <http://soloway.pbworks.com/w/file/fetch/46715502/Crossing-The-Chasm.pdf>.

Oesch et al 2005

Oesch, R. – Rinkineva, M. – Hietamies, H. – Puustinen, K.: *Mallioikeus - muotoilun suoja*, Talentum, 2005.

Pakarinen 2006a

Pakarinen, M.: *Tavaramerkin oikeudellinen suoja-ala ja tavaramerkin käyttö verkkotunnuksessa*, IPR Series A:2, IPR University Center, 2006.

Palm 2002

Palm, J.: *Tavaramerkki, kilpailu ja alkuperä*, Suomalainen Lakimiesyhdistys, 2002.

Phillips 2003

Phillips, J.: *Trade Mark Law – A Practical Anatomy*, Oxford University Press, 2003.

Pihlajarinne 2009

Pihlajarinne, T.: *Tunnusmerkin suoja verkkotunnuskäytössä*, Edita, 2009.

Pihlajarinne 2010

Pihlajarinne, T.: *Toisen tavaramerkin sallittu käyttö*, Lakimiesliiton kustannus, 2010.

Pihlajarinne 2012a

Pihlajarinne, T.: *Lupa linkittää - toisen aineiston hyödyntämisen tekijänoikeudelliset rajat*, Lakimiesliiton kustannus, 2012.

Reich 2005

Reich, N.: *Understanding EU Law*, Intersentia, Antwerpen – Oxford, 2005.

Salmi et al 2008

Salmi, H. – Häkkänen, P. – Oesch, R. – Tommila, M.: *Tavaramerkki*, Talentum, 2008.

Simon Fhima 2014

Simon Fhima, I.: 'Trade Mark Law and Advertising Keywords', in A. I. Savin – J. Trzaskowski (Eds.): *Research handbook on EU Internet law*, pp. 143–167, Cheltenham: Edward Elgar Publishing, 2014.

Siltala 2003

Siltala, R.: *Oikeustieteen tieteenteoria*, Suomalainen Lakimiesyhdistys, 2003.

Tridimas 2006

Tridimas, T.: *The General Principles of EU Law*, Second Edition, Oxford University Press, 2006.

Tolonen 2003

Tolonen, H.: *Oikeuslähdeoppi*, WSOY Lakitieto, 2003

Tuori 2007

Tuori, K.: *Oikeuden ratio ja voluntas*, Talentum Media Oy, 2007.

Van den Berg et al 2016

Berg, B. v. d. – Hof, S. v. d. – Kosta, E. (eds.): *3D Printing: Legal, Philosophical and Economic Dimensions*, Information Technology and Law Series, Vol. 26, Springer, 2016.

Articles

Badger 2007

Badger, C.: 'Trademark Use', Trademark World, September 2007, pp. 29–31.

Ballardini – Norrgård – Minssen 2015

Ballardini, R. M. – Norrgård, M. – Minssen, T.: 'Enforcing Patents in the Era of 3D Printing', Journal of Intellectual Property Law & Practice, 2015, 10(11), pp. 850–866.

Bechtold 2016

Bechtold, S.: '3D Printing, Intellectual Property and Innovation Policy', International Review of Intellectual Property and Competition Law, 2016, 47(5), pp. 517–536.

Blythe 2014

Blythe, A.: ‘Confusion Online: Does the Test for Trade Mark Confusion on the Internet Differ from that Applied to Infringement in Other Spheres?’, European Intellectual Property Review, 2014, 36(9), pp. 563–568.

Blythe 2015a

Blythe, A.: ‘Misrepresentation, Confusion and the Average Consumer: to What Extent are the Tests for Passing Off and Likelihood of Confusion within Trade Mark Law Identical?’, European Intellectual Property Review, 2015, 37(8), pp. 484–489.

Blythe 2015b

Blythe, A.: ‘In Search of Mr Average: Attempting to Identify the Average Consumer and His Role within Trade Mark Law’, European Intellectual Property Review, 2015, 37(11), pp. 709–715.

Blythe 2016

Blythe, A.: ‘Initial Interest Confusion: Attempting to Define Its Current Status within European Trade Mark Law’, European Intellectual Property Review, 2016, 38(4), pp. 201–207.

Bradshaw – Bowyer – Haufe 2010

Bradshaw, S. – Bowyer, A. – Haufe, P.: ‘The Intellectual Property Implications of Low-Cost 3D Printing’, SCRIPTed, 2010, 7(1).

Breitschaft 2010

Breitschaft, A.: ‘The Future of the Passing-Off Action in the Law against Unfair Competition - an Evaluation from a German Perspective’, European Intellectual Property Review, 2010, 32(9), pp. 427–436.

Chinn 2016

Chinn, A.: ‘How Has Technology Affected the Copyright Framework? A Focus on Digital Rights Management and Peer-to-Peer Technology’, Computer and Telecommunications Law Review, 2016, 22(2), pp. 44–52.

Clay 2011

Clay, A.: ‘Case Peport: RFID Patent Infringement - Datacard Corp v Eagle Technologies Ltd’, Computer and Telecommunications Law Review, 2011, 17(4), pp. 101–104.

Cook 2014

Cook, T.: ‘Three Dimensional Trade Marks in the European Union’, Journal of Intellectual Property Rights, 2014, Vol. 19, pp. 423–427.

Cornthwaite 2012

Cornthwaite, J.: ‘Say It with Flowers: the Judgment of the Court of Justice of the European Union in Interflora v Marks & Spencer’, European Intellectual Property Review, 2012, 34(2), pp. 127–132.

Dagne 2015

Dagne, T. W.: ‘The Left Shark, Thrones, Sculptures and Unprintable Triangle: 3D Printing and Its InterSections with IP’, Albany Law Journal of Science Technology, 2015, 25(3), pp. 573–592.

Depoorter 2014

Depoorter, B.: ‘Intellectual Property Infringements & 3D Printing: Decentralized Piracy’, Hastings Law Journal, 2014, 65(6), pp. 1483–1504

Desai – Magliocca 2014

Desai, D. R. and Magliocca, G. N.: ‘Patents, Meet Napster: 3D Printing and the Digitization of Things’, The Georgetown Law Journal, 2014, 102(6), pp. 1691–1720.

Ebrahim 2016a

Ebrahim, T. Y.: ‘Trademarks & Brands in 3D Printing’, Wake Forest Journal of Business and Intellectual Property Law, 2016, 17(1), pp. 1–53.

Ebrahim 2016b

Ebrahim, T. Y.: ‘3D Printing: Digital Infringement & Digital Regulation’, Northwestern Journal of Technology and Intellectual Property, 2016, 14(1), pp. 37–74.

Ehrlich 1991

Ehrlich, D.: ‘When Should Post-Sale Confusion Prevent Use or Registration of Marks?’, The Trademark Reporter, 1991, 81(3), pp. 267–284.

Folliard-Monguiral – Rogers 2003

Folliard-Monguiral, A. – Rogers, D.: ‘The Protection of Shapes by the Community Trade Mark’, European Intellectual Property Review, 2003, 25(4), pp. 169–179.

Geiger 2004

Geiger, C.: ‘Fundamental Rights, a Safeguard for the Coherence of Intellectual Property Law?’, International Review of Intellectual Property and Competition Law, 2004, 35(3), pp. 268–280

Gielen 1998

Gielen, C.: ‘Case Comment - A Benelux Perspective: Sabel v Puma’, European Intellectual Property Review, 1998, 20(3), pp. 109–111.

Gillieron 2008

Gillieron, P.: ‘Online Advertising Business Models and Distinctive Signs - Should One Rethink the Concept of Confusion?’, International Review of Intellectual Property and Competition Law, 2008, 39(6), pp. 688–706.

Grace 2014

Grace, J.: ‘The End of Post-Sale Confusion: How Consumer 3D Printing Will Diminish the Function of Trademarks’, Harvard Journal of Law & Technology, 2014, 28(1), pp. 263–287.

Günther 2016

Günther, P.: ‘The Plan for a Digital Single Market in Europe and Reforming EU Copyright Rules to Develop a Market-Oriented Approach to Reduce Infringement on the Internet’, European Intellectual Property Review, 2016, 38(1), pp. 43–55.

Hornick 2015

Hornick, J. F.: ‘3D Printing and IP Rights: The Elephant in the Room’, Santa Clara Law Review, 2015, 55(4), pp. 801–820.

Hornick 2014

Hornick, J. F.: ‘How to Tell What's Real and What's Fake in a 3D Printed World’, 3D Printing Industry, 5 February 2014. Retrieved from <http://www.finnegan.com/resources/articles/>.

Johnson 2015

Johnson, H.: ‘Case Comment - Trade Marks, Chocolate and Surrealism: Case C-215/14, Societe des Produits Nestle SA v Cadbury (UK) Ltd’, Communications Law, 2015, 20(4), pp. 128–131.

Lemley 2015

Lemley, M. A.: ‘IP in a World without Scarcity’, New York University Law Review, 2015, 90(2), pp. 460–515.

Li – Kucukkoc – Zhang 2017

Li, Q. – Kucukkoc, I. – Zhang, D. Z.: ‘Production Planning in Additive Manufacturing and 3D Printing’, Computers and Operations Research, 2017, Vol. 83, pp. 157–172.

Lilja 2012

Lilja, J.: ‘Designista tavaramerkiksi - Kolmiulotteiset tavaramerkit tuotteen ulkomuodon suojana’, IPRinfo internet magazine, No. 3, 2012.

Mathias – Rao 2015

Mathias, E. and Rao, B.: ‘3D Printing: On Its Historical Evolution and the Implications for Business’, 2015, Portland International Conference on Management of Engineering and Technology, pp. 551–558.

Maynard 2000

Maynard, B.: ‘The Initial Interest Confusion Doctrine and Trademark Infringement on the Internet’, Washington and Lee Law Review, 2000, 57(4), pp. 1303–1354.

Mendis 2014

Mendis, D.: ‘”Clone Wars” Episode II - The Next Generation: The Copyright Implications Relating to 3D Printing and Computer-Aided Design (CAD) Files’, Law, Innovation and Technology, 2014, 6(2), pp. 265–281.

Mendis 2013

Mendis, D.: ‘”The Clone Wars”: Episode I – The Rise of 3D Printing and its Implications for Intellectual Property Law: Learning Lessons from the Past?’, European Intellectual Property Review, 2013, 35(3) pp. 155–169.

Mills 1995

Mills, B.: ‘Own Label Products and the "Lookalike" Phenomenon: a Lack of Trade Dress and Unfair Competition Protection?’, European Intellectual Property Review, 1995, 17(3), pp. 116–132.

Morris 2012

Morris, P. S.: ‘Guess What Gucci? Post-Sale Confusion Exists in Europe’, Valparaiso University Law Review, 2012, 47(1), pp. 1–62.

Mueller-Stofen 1997

Mueller-Stofen, T.: ‘Domain Name-Related Infringement Procedures in Germany’, The Trademark Reporter, 1997, 87(5), pp. 590–612.

Osborn 2014

Osborn, L.: ‘Regulating Three-Dimensional Printing: The Converging Worlds of Bits and Atoms’, San Diego Law Review, 51(2), pp. 553–622.

Pakarinen 2006b

Pakarinen, M.: ‘Eurooppalainen tavaramerkkioikeus ja tavaramerkin suoja-alaa koskevat säännöt’, Defensor Legis, 2006, No. 1, pp. 43–58.

Pihlajarinne 2012b

Pihlajarinne, T.: ‘Eurooppalaisen tuomioistuinkäytännön hyödyntäminen immateriaalioikeuden tutkimuksessa’, Lakimies 2012, No. 4, pp. 547–558.

Pihlajarinne 2012c

Pihlajarinne, T.: ‘Immateriaalioikeuden yleiset opit ja digitalisoituminen – vertailussa tekijänoikeus ja tavaramerkkioikeus’, Lakimies, 2012, No. 3, pp. 383–396.

Pontoppidan 2000

Pontoppidan, L.: ‘The European Court of Justice's Interpretation of Reputation. General Motors v Yplon SA’, ECTA Newsletter, May 2000, No. 39, pp. 47–50.

Ribbons 2011

Ribbons, D.: ‘What's the Difference Between Article 5(1)(a) and 5(1)(b)? Not a Lot...’, Journal of Intellectual Property Law & Practice, 2011, 6(7), pp. 435–436.

Rideout 2011

Rideout, B.: ‘Printing the Impossible Triangle: The Copyright Implications of Three-Dimensional Printing’, The Journal of Business, Entrepreneurship & the Law, 2011, 5(1), pp. 161–177. Available at: http://digitalcommons.pepperdine.edu/jbel/vol5/iss1/6.

Roncaglia 1998

Roncaglia P. L.: ‘Should We Use Guns and Missiles to Protect Famous Trademarks in Europe?’, The Trademark Reporter, 1998, 88(6), pp. 551–563.

Samuel 2007

Samuel, G.: ‘Taking Methods Seriously (Part Two)’, Journal of Comparative Law, 2007, 2(2), pp. 210–237.

Scardamaglia 2015

Scardamaglia, A.: ‘Flashpoints in 3D Printing and Trade Mark Law’, Journal of Law, Information and Science, 2015, 23(2), pp. 30–54.

Schober 2013

Schober, N.: ‘The Function of a Shape as an Absolute Ground for Refusal’, International Review of Intellectual Property and Competition Law, 2013, 44(1), pp. 35–62.

Senftleben 2011

Senftleben, M. R.: ‘Keyword Advertising in Europe How the Internet Challengers Recent Expansions of EU Trademark Protection’, Connecticut Journal of International Law, 2011, 27(1), pp. 39–76.

Simon 2005

Simon, I.: ‘How Does “Essential Function” Doctrine Drive European Trade Mark Law?’, International Review of Intellectual Property and Competition Law, 2005, 36(4), pp. 401–420.

Simon Fhima 2013

Simon Fhima, I.: ‘Initial Interest Confusion’, Journal of Intellectual Property Law & Practice, 2013, 8(4), pp. 311–318.

Tarawneh 2016

Tarawneh, J.: ‘A New Classification for Trade Mark Functions’, Intellectual Property Quarterly, 2016, No. 4, pp. 352–370.

Tran 2015

Tran, J.: ‘The Law and 3D Printing’, John Marshall Journal of Information Technology and Privacy Law, 2015, 31(4), pp. 505–520.

Turner-Kerr 2001

Turner-Kerr, P. M.: 'Case Comment: Confusion or Association under the European Trade Mark Directive', European Intellectual Property Review, 2001, 23(1), pp. 49–51.

Vogel 2016

Vogel, B.: 'Intellectual Property and Additive Manufacturing / 3D Printing: Strategies and Challenges of Applying Traditional IP Laws to a Transformative Technology', Minnesota Journal of Law, Science & Technology, 2016, 17(2), pp. 881–905.

Yap 2009

Yap, P.: 'Essential Function of a Trade Mark: From BMW to O2', European Intellectual Property Review, 2009, 31(2), pp. 81-87.

Yelnik 2010

Yelnik, A.: 'Commercial Value of Trade Marks: Do Current Laws Provide Brands Sufficient Protection From Infringement?', European Intellectual Property Review, 2010, 32(5), pp. 203–219.

Ferrill – Sirolly – Yoches 2013

Ferrill, E. D. – Sirolly, B. T. – Yoches, E. R.: 'Securing IP Rights in a 3D-Printing World', American Intellectual Property Law Association, 18 December 2013. Retrieved from <www.finnegan.com/resources/articles/>.

Internet sources

3DHubs: What is 3D Printing, <https://www.3dhubs.com/what-is-3d-printing>, last visited on 9 March 2017.

3DPrinting Industry: The Free Beginner's Guide: 3D Printing Materials, <https://3dprintingindustry.com/3d-printing-basics-free-beginners-guide/materials/>, last visited on 4 April 2017

3DPrinting.com: Compare 3D printing services, <https://3dprinting.com/3d-printing-service/>, last visited on 6 April 2017.

Banwatt, P.: 3D Printing Law: Trademarks – Why "FDM" isn't for Everybody, Law in the Making, 7 March 2013, <http://lawitm.com/3d-printing-law-trademarks-why-fdm-isnt-for-everybody/>, last visited on 5 April 2017 (*Banwatt 2013*).

Gartner Hype Cycle, <<http://www.gartner.com/technology/research/methodologies/hype-cycle.jsp>, last visited on 23 April 2017.

Grieser, F.: What Resolution Can 3D Printers Print?, All About 3D Printing, 29 December 2015 <https://all3dp.com/3d-printer-resolution/>, last visited on 4 April 2017 (*Grieser 2015*).

Krassenstein, B.: Carbon3D Unveils Breakthrough CLIP 3D Printing Technology, 25-100X Faster, 3DPrint.com, 16 March 2015, <https://3dprint.com/51566/carbon3d-clip-3d-printing/>, last visited on 8 April 2017 (*Krassenstein 2015*).

Lehmann P. – Draheim, Y.: 3D-Printing - How are trademarks affected?, Lexology, 26 August 2016, <http://www.lexology.com/library/detail.aspx?g=52b2dfc8-ca0b-4bbe-bff0-f47355a14f9d>, last visited on 3 April 2017 (*Lehmann – Draheim 2016*).

McCue, T.: Tech Specs on 3D Printing Materials, Lifewire, 14 February 2017, <https://www.lifewire.com/specs-on-3d-printing-materials-2232>, last visited on 3 April 2017 (*McCue 2017*).

Molitch-Hou, M.: Consumer 3D Printing More than 5 Years Away from Mainstream Adoption, Says Gartner, 3D Printing Industry, 20 August 2014, <https://3dprintingindustry.com/news/consumer-3d-printing-5-years-away-mainstream-adoption-says-gartner-31677/>, last visited on 19 April 2017 (*Molitch-Hou 2014*).

Shapeways <https://www.shapeways.com/>, last visited on 6 April 2017.

Thompson, C.: 3D printing has expanded much faster than expected, Business Insider, 18 August 2015, <http://www.businessinsider.com/gartner-hype-cycle-report-shows-3d-printing-expanding-2015-8?r=US&IR=T&IR=T>, last visited on 5 April 2017 (*Thompson 2015*).

The Economist: A Third Industrial Revolution, in Special Report: Manufacturing and Innovation, 21 April 2012, <http://www.economist.com/node/21552901>, last visited on 10 April 2017.

Tinkedcad: <www.tinkercad.com>, last visited on 23 April 2017.

TABLE OF CASES

<u>European Court of Justice</u>

Case C-440/16 P, Staywell Hospitality Group Pty Ltd v European Union Intellectual Property Office, 12 January 2017, ECLI:EU:C:2017:16.

Case C-215/14, Société de Produits Nestlé SA v Cadbury UK Ltd, 16 September 2015, ECLI:EU:C:2015:604.

Case C-307/10, Chartered Institute of Patent Attorneys v Registrar of Trade Marks, 19 June 2012, ECLI:EU:C:2012:361.

Case C-482/09, Budějovický Budvar, národní podnik v Anheuser-Busch Inc., 22 September 2011, ECLI:EU:C:2011:605 (*Budějovický Budvar*).

Case C-323/09, Interflora Inc. and Interflora British Unit v Marks & Spencer plc and Flowers Direct Online Ltd, 22 September 2011, ECLI:EU:C:2011:604 (*Interflora*).

Case C-558/08, Portakabin Ltd and Portakabin BV v Primakabin BV, 8 July 2010, ECLI:EU:C:2010:416 (*Portakabin*).

Case C-51/09 P, Barbara Becker v Harman International Industries Inc, 24 June 2010, ECLI:EU:C:2010:368.

Joined cases C-236/08 to C-238/08, Google France SARL and Google Inc. v Louis Vuitton Malletier SA (C-236/08), Google France SARL v Viaticum SA and Luteciel SARL (C-237/08) and Google France SARL v Centre national de recherche en relations humaines (CNRRH) SARL and Others (C-238/08), 23 March 2010, ECLI:EU:C:2010:159 (*Google France*).

Case C-498/07 P, Aceites del Sur-Coosur SA v Koipe Corporación SL and Office for Harmonisation in the Internal Market (Trade Marks and Designs), 3 September 2009, ECLI:EU:C:2009:503.

Case C-487/07, L'Oréal SA, Lancôme parfums et beauté & Cie SNC and Laboratoire Garnier & Cie v Bellure NV, Malaika Investments Ltd and Starion International Ltd, 18 June 2009, ECLI:EU:C:2009:378 (*L'Oréal*).

Case C-398/07 P, Waterford Wedgwood plc v Assembled Investments (Proprietary) Ltd and Office for Harmonisation in the Internal Market (Trade Marks and Designs), 7 May 2009, ECLI:EU:C:2009:288 (*Waterford Wegwood*).

Case C-252/07, Intel Corporation Inc. v CPM United Kingdom Ltd, 27 November 2008, ECLI:EU:C:2008:655 (*Intel*).

Case C-497/07 P, Philip Morris Products SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 27 June 2008, ECLI:EU:C:2008:372.

Case C-533/06, O2 Holdings Limited and O2 (UK) Limited v Hutchison 3G UK Limited, 12 June 2008, ECLI:EU:C:2008:339 (*O2 Holdings*).

Case C-102/07, Adidas AG and Adidas Benelux BV v Marca Mode CV and Others, 10 April 2008, ECLI:EU:C:2008:217 (*Adidas II*)

Case C-301/05 P, Hans-Peter Wilfer v Office for Harmonisation in the Internal Market (Trade Marks and Designs) (OHIM), 11 October 2007, ECLI:EU:C:2007:593.

Case C-131/06 P, Castellblanch SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 24 April 2007, ECLI:EU:C:2007:246.

Case C-48/05, Adam Opel AG v Autec AG, 25 January 2007, ECLI:EU:C:2007:55 (*Adam Opel*).

Case C-321/03, Dyson Ltd v Registrar of Trade Marks, 25 January 2007, ECLI:EU:C:2007:51.

Case C-104/05 P, El Corte Inglés, SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 28 September 2006, ECLI:EU:C:2006:611.

Case C-214/05 P, Sergio Rossi SpA v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 18 July 2006, ECLI:EU:C:2006:494.

Case C-25/05 P, August Storck KG v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 22 June 2006, ECLI:EU:C:2006:422.

Case C-24/05 P, August Storck KG v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 22 June 2006, ECLI:EU:C:2006:421 (*August Storck*).

Case C-416/04 P, The Sunrider Corp. v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 11 May 2006, ECLI:EU:C:2006:310

Case C-361/04 P, Claude Ruiz-Picasso and Others v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 12 January 2006, ECLI:EU:C:2006:25 (*Ruiz-Picasso*).

Case C-173/04 P, Deutsche SiSi-Werke GmbH & Co. Betriebs KG v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 12 January 2006, ECLI:EU:C:2006:20 (*Deutsche SiSi-Werke*).

Case C-120/04, Medion AG v Thomson multimedia Sales Germany & Austria GmbH, 6 October 2005, ECLI:EU:C:2005:594 (*Medion*).

Case C-245/02, Anheuser-Busch Inc. v Budějovický Budvar, národní podnik, 16 November 2004, ECLI:EU:C:2004:717 (*Anheuser-Busch*).

Case C-106/03 P, Vedial SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 12 October 2004, ECLI:EU:C:2004:611.

Case C-136/02 P, Mag Instrument Inc. v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 7 October 2004, ECLI:EU:C:2004:592 (*Mag Instrument*).

Case C-329/02 P, SAT.1 SatellitenFernsehen GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 16 September 2004, ECLI:EU:C:2004:532 (*SAT.1*).

Joined cases C-468/01 P to C-472/01 P, Procter & Gamble Company v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 29 April 2004, ECLI:EU:C:2004:259.

Case C-3/03 P, Matratzen Concord GmbH, formerly Matratzen Concord AG v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 28 April 2004, ECLI:EU:C:2004:233.

Case C-218/01, Henkel KGaA, 12 February 2004, ECLI:EU:C:2004:88 (*Henkel*).

Case C‑363/99, Koninklijke KPN Nederland NV v Benelux-Merkenbureau, 12 February 2004, ECLI:EU:C:2004:86.

Case C-283/01, Shield Mark BV v Joost Kist h.o.d.n. Memex, 27 November 2003, ECLI:EU:C:2003:641 (*Shield Mark*).

Case C-408/01, Adidas-Salomon AG and Adidas Benelux BV v Fitnessworld Trading Ltd, 23 October 2003, ECLI:EU:C:2003:582 (*Adidas-Salomon*).

Joined cases C-53/01 to C-55/01, Linde AG (C-53/01), Winward Industries Inc. (C-54/01) and Rado Uhren AG (C-55/01), 8 April 2003, ECLI:EU:C:2003:206.

Case C-291/00, LTJ Diffusion SA v Sadas Vertbaudet SA, 20 March 2003, ECLI:EU:C:2003:169.

Case C-292/00, Davidoff & Cie SA and Zino Davidoff SA v Gofkid Ltd., 9 January 2003, ECLI:EU:C:2003:9 (*Davidoff*).

Case C-273/00, Ralf Sieckmann v Deutsches Patent- und Markenamt, 12 December 2002, ECLI:EU:C:2002:748 (*Sieckmann*).

Case C-23/01, Robelco NV v Robeco Groep NV, 21 November 2002, ECLI:EU:C:2002:706.

Case C-206/01, Arsenal Football Club plc v Matthew Reed, 12 November 2002, ECLI:EU:C:2002:651 (*Arsenal*).

Case C-299/99, Koninklijke Philips Electronics NV v Remington Consumer Products Ltd., 18 June 2002, ECLI:EU:C:2002:377 (*Philips*).

Case C-425/98, Marca Mode CV v Adidas AG and Adidas Benelux BV, 22 June 2000, ECLI:EU:C:2000:339 (*Adidas*).

Case C-375/97, General Motors Corporation v Yplon SA, 14 September 1999, ECLI:EU:C:1999:408 (*Chevy*).

Case C-342/97, Lloyd Schuhfabrik Meyer & Co. GmbH v Klijsen Handel BV, 22 June 1999, ECLI:EU:C:1999:323 (*Lloyd Schuhfabrik*).

Case C-63/97, Bayerische Motorenwerke AG (BMW) and BMW Nederland BV v Ronald Karel Deenik, 23 February 1999, ECLI:EU:C:1999:82 (*BMW*).

Case C-39/97, Canon Kabushiki Kaisha v Metro-Goldwyn-Mayer Inc., formerly Pathe Communications Corporation, 29 September 1998, ECLI:EU:C:1998:442 (*Canon*).

Case C-251/95, SABEL BV v Puma AG, Rudolf Dassler Sport, 11 November 1997, ECLI:EU:C:1997:528 (*Sabel*).

Case C-337/95, Parfums Christian Dior SA and Parfums Christian Dior BV v Evora BV, 4 November 1997, ECLI:EU:C:1997:517 (*Dior*).

Case 102/77, Hoffmann-La Roche & Co. AG v Centrafarm Vertriebsgesellschaft Pharmazeutischer Erzeugnisse mbH, 23 May 1978, ECLI:EU:C:1978:108.

<u>General Court of the European Union</u>

Case T-742/14, Alpha Calcit Füllstoffgesellschaft mbh v European Union Intellectual Property Office, 19 July 2016, ECLI:EU:T:2016:418.

Case T-443/12, Equinix (Germany) GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 21 November 2013, ECLI:EU:T:2013:605.

Case T-54/12, K2 Sports Europe GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 31 January 2013, ECLI:EU:T:2013:50.

Case T-508/08, Bang & Olufsen A/S v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 6 October 2011, ECLI:EU:T:2011:575.

Case T-175/06, The Coca-Cola Company v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 18 June 2008, ECLI:EU:T:2008:212.

Case T-443/05, El Corte Inglés, SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 11 July 2007, ECLI:EU:T:2007:219.

Case T-150/04, Mülhens GmbH & Co. KG v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 11 July 2007, ECLI:EU:T:2007:214.

Case T-262/04, BIC SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 15 December 2005, ECLI:EU:T:2005:463.

Case T-29/04, Castellblanch, SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 8 December 2005, ECLI:EU:T:2005:438.

Case T-315/03, Hans-Peter Wilfer v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 8 June 2005, ECLI:EU:T:2005:211.

Case T-169/03, Sergio Rossi SpA v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 1 March 2005, ECLI:EU:T:2005:72.

Case T-8/03, El Corte Inglés, SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 13 December 2004, ECLI:EU:T:2004:358.

Case T-203/02, The Sunrider Corp. v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 8 July 2004, ECLI:EU:T:2004:225.

Case T-224/01, Durferrit GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 9 April 2003, ECLI:EU:T:2003:107.

Case T-99/01, Mystery drinks GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 15 January 2003, ECLI:EU:T:2003:7.

Case T-110/01, Vedial SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 12 December 2002, ECLI:EU:T:2002:318.

Case T-316/00, Viking-Umwelttechnik GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 25 September 2002, ECLI:EU:T:2002:225.

Case T-34/00, Eurocool Logistik GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 27 February 2002, ECLI:EU:T:2002:41 (*Eurocool*).

Case T-337/99, Henkel KGaA v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 19 September 2001, ECLI:EU:T:2001:221.

Opinions of Advocate Generals

Opinion of Advocate General Kokott in the case C-412/05 P, Alcon Inc. v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 26 October 2006, ECLI:EU:C:2006:687.

Opinion of Advocate General Colomer in the case C-361/04 P, Claude Ruiz-Picasso and Others v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 8 September 2005, ECLI:EU:C:2005:531.

Joined opinion of Advocate General Ruiz-Jarabo Colomer in the joined cases C-456/01 P and C-457/01 P, Henkel KGaA v Office for Harmonisation in the Internal Market (Trade Marks and Designs) and C-468/01 P to C-474/01 P, Procter & Gamble Company v Office for Harmonisation in the Internal Market (Trade Marks and Designs), 6 November 2003, ECLI:EU:C:2003:602.

Opinion of Advocate General Ruiz-Jarabo Colomer in the case C-206/01, Arsenal Football Club plc v Matthew Reed, 13 June 2002, ECLI:EU:C:2002:373.

Opinion of Advocate General Jacobs in the case C-2/00, Michael Hölterhoff v Ulrich Freiesleben, 20 September 2001, ECLI:EU:C:2001:468.

Opinion of Advocate General Jacobs in the case C-425/98, Marca Mode CV v Adidas AG and Adidas Benelux BV, 27 January 2000, ECLI:EU:C:2000:56.

Opinion of Advocate General Jacobs in the case C-342/97, Lloyd Schuhfabrik Meyer & Co. GmbH v Klijsen Handel BV, 29 October 1998, ECLI:EU:C:1998:522.

EUIPO/OHIM Board of Appeal

Case R 373/2006-2, Philip Morris Product S.A., 14 July 2006.

Case R 75/2005-4, Philip Morris Product S.A., 24 February 2006.

Case R 476/2001-3, Eurocos Cosmetic GmbH, 7 August 2001.

Case R 795/1999-1, Durigon GmbH v Rank Hovis Limited, 21 March 2001 (Allegro/ALLEGRO).

Case R 488/1999-2, H. J. Heinz Company, Limited, 3 August 2000.

National Courts

Finnish Courts

Finnish Supreme Court case KKO 2005:143, volume number 3264, 29 December 2005.

Finnish Supreme Court case KKO 2004:49, volume number 1191, 30 September 2003.

German Courts

German Bundesgerichthof case I ZR 235/00, GRUR 2003, 428 "Big Bertha", 10 October 2002.

UK Courts

Chancery Division (Patents Court) case Datacard Corp v Eagle Technologies Ltd [2011] R.P.C. 17, 14 February 2011.

High Court of Justice (Chancery Division) case Och-Ziff Management Europe Ltd v Och Capital LLP [2011] F.S.R. 11, 20 October 2010.

High Court of Justice (Chancery Division) case Société de Produits Nestlé SA v Unilever Plc [2003] E.T.M.R. 53, 18 December 2002.

High Court of Justice (Chancery Division) case Kimberley-Clark Limited v Fort Sterling Limited [1997] F.S.R. 877, 21 April 1997.

US Courts

US District Court for the District of New Jersey case No. 2:16-cv-02500-SDW-LDW, BMW Group v. Turbosquid, Inc., 3 May 2016.

ABBREVIATIONS

ABS	Acrylonitrile Butadiene Styrene

BoA	Board of Appeal of EUIPO/OHIM
CAD	Computer Assisted Design
CJEU	Court of Justice of the European Union
DRM	Digital Rights Management
ECJ	European Court of Justice
EUIPO	European Union Intellectual Property Office
EUTM	European Union Trade Mark
FDM	Fused Deposition Modelling
FFF	Fused Filament Fabrication
GC	General Court of the European Union
IPR	Intellectual Property Rights
LOM	Laminated Object Manufacturing
OHIM	Office for Harmonisation in the Internal Market (current EUIPO)
PLA	Polylactic Acid
SLA	Stereolithiography
TEU	Treaty on European Union
TFEU	Treaty on the Functioning of the European Union
TMD	Directive (EU) 2015/2436 of the European Parliament and of the Council of 16 December 2015 to approximate the laws of the Member States relating to trade marks (*Trade Mark Directive*)
TMR	Council Regulation (EC) No 207/2009 of 26 February 2009 on the European Union Trade Mark, as amended by Regulation (EU) 2015/2424 of the European Parliament and of the Council 16 December 2015 (*Trade Mark Regulation*)

1. INTRODUCTION

Imagine that you need a new pair of sunglasses. Being a tech-savvy citizen, instead of completing the tedious task of walking to the nearest store you want to try your new 3D printer and the new web service that sells 3D design files.[1] You browse the website for a while and come across a familiar-looking pair of fancy sunglasses, which you choose and download without further inspecting the design file. You think that it is great that the company manufacturing these sunglasses has jumped on the 3D printing bandwagon by offering their model for 3D printing on the web service. When you print out the sunglasses and take a closer look, you notice that they are not, however, the sunglasses you thought you ordered since they are noticeably different from the fancy ones you wanted. After double-checking the website, you notice that the design does not actually have anything to do with the company as you thought and there is even a small print disclaimer informing that the design is "for private use only". You wonder, if the original design of the fancy sunglasses was protected by a three-dimensional trade mark, was there likelihood of confusion?

The situation described above might sound like science fiction, but it is becoming more of a reality and faster than one might think. The emergence of 3D printing is one of the significant new technological developments brought about by digitisation. The concept of 3D printing itself is not particularly new since the underlying idea was invented already in the 70's. However, the development of the technology has not seen significant progress until recent years, It has been furthered partly by the digital revolution, and to some extent, the expiry of certain key patents.[2] Digitisation has made possible the unprecedented rapid development of the technology behind 3D printing, which has already passed the peak of the so-called Gartner hype line.[3] The industry is growing fast with an annual growth of circa 35 % of compound annual growth rate in 2015.[4] In contrast to most technical advances related to the digital era that usually concern advances made in cyberspace, the most important aspect of 3D printing is the possibility to derive almost any kind of tangible object from a digital document. All one needs to start producing fully functional products is a 3D

[1] Digital design files are commonly referred to as CAD files (Computer Assisted Design files).
[2] Ballardini – Norrgård – Minssen 2015, p. 850 and Bechtold 2016, pp. 532–533.
[3] Thompson 2015. The Gartner hype line provides a graphic representation of the level of maturity and adoption of emerging technologies and applications, and their potential relevance in exploiting new opportunities and solving existing business problems. See <http://www.gartner.com/technology/research/methodologies/hype-cycle.jsp>, last visited on 23 April 2017.
[4] Ebrahim 2016a, p. 6.

printer, a computer and some basic raw material. Besides revolutionising industrial manufacturing, the technology is finding its way into the consumer market as well.[5] The price of 3D printers and design software has fallen dramatically in recent years and a proper 3D printer can currently be purchased at less than 1.000 euros.[6] Therefore, the technology is becoming widely accessible to the public, resulting in unprecedented economical and legal effects due to the exponential growth in 3D printer use. This can justifiably be said to encompass the real revolution of manufacturing behind 3D printing.[7]

The technology is still in its infancy, but it promises significant benefits in comparison with traditional methods of production and we may just be at the verge of the "third industrial revolution".[8] Some scholars have referred to it as one of the most significantly disruptive technologies in the digital economy.[9] 3D printing has been said to democratise production by breaking the grasp of traditional manufacturing firms on manufacturing.[10] Some experts have even suggested the emergence of decentralised cloud manufacturing instead of centralised mass manufacturing.[11] The new technology is not necessarily at odds with traditional manufacturing. On the contrary, 3D printing can be used in combination with traditional manufacturing, e.g. in creating flexible, repeatable and scalable master molds for injection-molding bulk goods.[12]

Not all aspects of this emerging technology are positive, though. New possibilities for manufacturing have also opened new possibilities for trade mark infringing activities that can deceive customers.[13] The manufacture of counterfeit products on-demand without the need for shipping them into the target country from the other side of the world is one of the new scenarios feared by some.[14] Once the technology develops even further, it may become

[5] According to Gartner's hype cycle in 2014, consumer 3D printing was predicted to be five to ten years away from full adoption. See Molitch-Hou 2014.
[6] Van den Berg et al 2016, p. 12.
[7] For example *Bechtold* has analysed the impacts of 3D printing on IP rights from a US perspective, drawing a distinction between the innovation ecosystems of industrial and personal 3D printing. See Bechtold 2016, pp. 523–526.
[8] Grace 2014, pp. 266–267 and The Economist: A Third Industrial Revolution, in Special Report: Manufacturing and Innovation, 21 April 2012, <http://www.economist.com/node/21552901>, last visited on 10 April 2017.
[9] Dagne 2015, p. 537.
[10] Ebrahim 2016a, pp. 9–10. *Ebrahim* has also suggested that by breaking the traditional production chains, 3D printing is changing the fundamental branding strategies in addition to means of manufacturing, emphasising brands instead of trade marks. Ebrahim 2016a, pp. 36–37.
[11] Lipson – Kurman 2013, p. 46.
[12] The Economist: A Third Industrial Revolution, in Special Report: Manufacturing and Innovation, 21 April 2012, <http://www.economist.com/node/21552901>, last visited on 10 April 2017.
[13] Vogel 2016, p. 904.
[14] Ebrahim 2016a, p. 4. *Ebrahim* has anticipated that trade marks will be de-emphasised in the era of 3D printing, due to decreased trade mark value and increased brand value.

impossible to separate counterfeit goods from authentic ones.[15] Since the new technology has gradually become widely used, the legal problems related thereto are also increasing in significance, especially in intellectual property law. Besides the obvious problems in relation to copyright, 3D printing is causing ripples also in the field of trade marks.[16] One of these problems concerns likelihood of confusion.

1.1. Methodological Background

In this treatise, the current state of trade mark law shall first be analysed by examining the relevant trade mark legislation and CJEU case law, as well as statements from legal literature. After establishing the legal framework, it will be assessed in contrast with the special characteristics of 3D printing in relation to certain questions. The method employed in this thesis can be characterised as doctrinal legal scholarship, combined with perspectives of law and economics. Both theoretical and practical doctrinal legal scholarship are used.[17] Economic arguments are included in order to support interpretations of existing law, to provide a practical framework of relevant situations in the scope of this research and to formulate *de lege ferenda* propositions for future legislative reforms. Results of empirical research related to issues of the technology itself will be assessed in light of their implications on legal questions

When it comes to the theoretical framework of this research, the main underlying theme is the emergence of new technologies and their related effects on the intellectual property rights regime. Since this treatise concerns intellectual property law, the starting point to establish a theoretical framework that supports the justifications for the legal system is the classical IPR dichotomy. This dichotomy consists of the protection of innovations by providing an economic incentive and monopoly-like exclusive rights on one hand and, in contrast, the concession to unrestricted technical development and undistorted competition, or *laissez-faire*, on the other. However, this does not fit easily to the context of trade marks, since in contrast to e.g. patents, the main purpose of trade marks is not the protection of innovations but safeguarding the distinction between the goods or services of the proprietor and possible competitors.[18] Due to this fundamental difference, *Landes and Posner* have

[15] Hornick 2014.
[16] Ballardini – Norrgård – Minssen 2015, p. 851.
[17] Siltala 2003, pp. 496–502.
[18] The same applies to the protection of trade names. Trade marks and trade names are sometimes referred to under the umbrella term "sign rights" (*tunnusmerkkioikeus*), due to the similar nature of the rights in comparison with other IP rights. See e.g. Pihlajarinne 2009 pp. 86–88.

suggested that trade mark law has a more secure economic efficiency rationale than other IP rights; trade marks are justifiable since they impose only minor restrictions on competition and provide benefits for customers for example in the form of diminished search costs.[19] This view can be called into question, and the perspectives adopted in the treatise implemented here are placed around the juxtaposition between trade mark proprietors and their respective competitors on the market instead of the users of the products.[20] Questions will be assessed mainly from the trade mark proprietor's viewpoint.

On a theoretical level, trade mark dichotomies can firstly be seen to encompass the juxtaposition between an extensive sphere of protection for the proprietor of trade mark rights and the freedom of competitors to exploit words, figures, shapes etc. of competitors. This carries some resemblance to the aforementioned classical IPR dichotomy, but in relation to signs instead of innovations.[21] Other dichotomies include the territoriality of trade mark protection against the ever-extending globalisation of markets,[22] and the requirement for the customers' capability to separate between goods or services and protection of the proprietor's investments in its trade mark. The latter is apparent i.a. in the relative and absolute grounds for refusal or invalidity of trade mark registration.[23] On the level of three-dimensional trade marks, the main juxtaposition is found between perpetual trade mark protection and time-restricted IP protection such as patent or design rights. In 3D printing, a paradigm dichotomy of holistic and individual levels can be found,[24] i.e. 3D printing as a phenomenon on the level of macro or micro economy. The focus of this research will be more on the level of macro economy, i.e. 3D printing as an economic phenomenon.

[19] Landes – Posner 2003, pp. 166–168 and 172–174. *Landes and Posner* represent the Chicago school of thought that strongly disapproves with the possibility of creating monopolies through trade marks. Since they represent the US trade mark regime, their arguments will only be employed as economic arguments.

[20] The argument that effective trade mark protection would benefit consumers is notably inferior to the economic benefits the proprietor gains through trade mark enforcement. For example, *Pakarinen* has noted the fact that trade marks are often used, or sought to be used, as competitive tools, especially in the field of three-dimensional trade marks. At least in such cases the proprietors are not particularly concerned about the search costs incurred on the consumers. See Pakarinen 2006a, pp. 89–90.

[21] Signs are not necessarily too distinct from innovations from an economic perspective, since developing a successful brand requires extensive investments in trade marks in the form of i.a. advertisement and development. This is even more apparent in connection with shape marks; developing an appealing and distinctive shape is quite close to creating any other type of innovation or invention protectable by patent or design rights.

[22] Pakarinen 2006b, pp. 43–44.

[23] See Section 2.4 below.

[24] Samuel 2007, pp. 224–225.

1.2. Scope of the Research and Research Question

From the point of view of this treatise, there are two different phenomenal levels of relevance in 3D printing: the aspects related to the digital CAD file[25] and secondly, questions regarding the printing of physical objects and legal implications related thereto. Furthermore, due to the structure of trade mark law and the different levels of phenomena, consequent to the characteristics of 3D printing explained above, two different scenarios of likelihood of confusion shall be assessed. The first scenario encompasses acts of creating a similar design to an existing three-dimensional trade mark and applying for registration based on *ab initio* distinctive character, i.e. applying the relative grounds for refusal or invalidity to a trade mark registration application. The second scenario concerns acts in relation to scanning and 3D printing or otherwise disseminating a CAD file or a physical product protected by a three-dimensional trade mark, i.e. infringement of the proprietor's exclusive right through use. Due to restricted space, the focus of this research is on naked shapes[26] and likelihood of confusion between such shapes, not between shapes and two-dimensional trade marks.

This treatise will focus on the recently updated system of the EU Trade Mark Directive.[27] National legislation will be examined when relevant in order to assess the current implementation of the Directive,[28] and the EU Trade Mark Regulation[29] as recently amended by Regulation 2015/2424/EU[30] will be assessed at certain points when comparison between the Regulation and the Directive is necessary e.g. due to similarities or differences in the trade mark systems provided for by the legislative instruments.[31] A comparison with other jurisdictions such as the US will be drawn in certain situations when relevant from the

[25] CAD files are the digital representation of the object to be printed, i.e. three-dimensional instructions to the 3D printer on how to print the object layer by layer. Without a feasible CAD file, 3D printing is impossible.
[26] Composite marks comprised of a shape mark and other types of trade marks such as word or figurative marks are mainly left outside the scope of this research.
[27] Directive (EU) 2015/2436 of the European Parliament and of the Council of 16 December 2015 to approximate the laws of the Member States relating to trade marks.
[28] Since the implementation period for new Trade Mark Directive has not yet expired, emphasis is placed on the Directive instead of national legislation of Member States.
[29] Council Regulation (EC) No 207/2009 of 26 February 2009 on the Community trade mark.
[30] Regulation (EU) 2015/2424 of the European Parliament and of the Council of 16 December 2015 amending Council Regulation (EC) No 207/2009 on the Community trade mark and Commission Regulation (EC) No 2868/95 implementing Council Regulation (EC) No 40/94 on the Community trade mark, and repealing Commission Regulation (EC) No 2869/95 on the fees payable to the Office for Harmonization in the Internal Market (Trade Marks and Designs).
[31] The TMR concerns the EU-wide registration of European Union trade marks, and is therefore different from the TMD mainly in a territorial sense.

point of view of this research.[32] Legal literature and case law relating directly to 3D printing is relatively scarce, owing to the novelty of the technology.[33] On the other hand, due to the wide wording of the relevant provisions, case law relating to likelihood of confusion in general is abundant, and will be assessed quite widely in the research.[34]

Protection for unregistered shapes is possible under the TMD and EU Member States, but the main focus of this research will be on registering three-dimensional trade marks and protecting registered three-dimensional trade marks. Accordingly, the common law doctrine of passing off, which is an important tool in i.a. trade mark protection of unregistered shapes,[35] will only be considered briefly due to its different character compared to the system of the TMD.[36] Matters relating to unfair competition are of similar character as trade mark protection,[37] but will be left outside the scope of this research due to limited space.

The main research question is posed as follows: how does the disruptive technology of 3D printing affect the doctrine of likelihood of confusion in relation to three-dimensional trade marks? As mentioned above and will be discussed below in more detail, 3D printing involves a fundamentally different manufacturing process compared to traditional mass manufacturing, and it is additionally introducing digitalisation into manufacturing in a whole new level, thus revolutionising the way we see products. Therefore, the implications that this change will have on a trade mark law doctrine of likelihood of confusion designed for the mass manufacturing age should be considered.

In order to further investigate this theme and to break it into more intelligible parts, a set of more specific aspects need to be assessed. Firstly, the special characteristics of three-dimensional trade marks and 3D printing need to be evaluated in order to find out what kind of shapes are eligible to constitute a protected trade mark and how the assessment of likelihood of confusion is different in connection with three-dimensional shapes. In relation to the technology it is assessed, how shapes are reproduced by 3D printing and what

[32] Due to extensive harmonisation at the level of international conventions, trade mark law is similar around the world, enabling arguments from different jurisdictions to be employed also in the interpretation of the TMD, to a limited extent or at least as persuasive arguments.
[33] Ballardini – Norrgård – Minssen 2015, p. 851. The amount of legal scholarship in the field is however increasing rapidly. See Tran 2015 on new US legal literature on 3D printing.
[34] 3D printing has not been addressed in national legislative materials so far, therefore the research will emphasise CJEU case law and legal literature.
[35] See e.g. Bradshaw – Bowyer – Haufe 2010, p. 29. For a detailed analysis of passing off claims, see Cornish – Llewelyn – Aplin 2013, pp. 651–692.
[36] On an analysis between the differences and similarities of passing off and likelihood of confusion see Blythe 2015a.
[37] Pakarinen 2006a, p. 86.

characteristics they possess. Secondly, the specifics of likelihood of confusion are inspected. The treatise aims to find out, whether the mere fact that a protected shape is reproduced by 3D printing is enough to exclude likelihood of confusion or not. Moving further into the realm of likelihood of confusion, the specific characteristics of likelihood of confusion assessment are identified by reflecting the doctrine against the characteristics of the technology. Thirdly, the significance of digital design files, i.e. CAD files, is assessed from the perspective of likelihood of confusion. The treatise assesses the special circumstances surrounding likelihood of confusion in the digital context, and attempts to elaborate the doctrine of likelihood of confusion with respect to CAD files. Also, the extent to which a shape needs to be adapted as a CAD file in order to exclude likelihood of confusion will be evaluated.[38]

Regarding the structure of this research, first the basics of trade mark protection and three-dimensional trade marks are established. Secondly, the special characteristics of additive manufacturing, i.e. 3D printing are assessed. Thirdly, the special characteristics of 3D printing are evaluated against the framework of protection of three-dimensional trade marks in relation to likelihood of confusion, and the specific aspects that need to be taken into account in the assessment are identified. Lastly, the key points in need of legislative reform or guidance from case law are identified.

[38] The treatise provides thus only a brief account of a single doctrine of European trade mark law and attempts to shed light on the doctrine and its compatibility with emerging disruptive technologies such as 3D printing. Future will hold how the field of trade mark law will develop in practice and it will be interesting to see whether such developments will concur with the suggestions presented later in this treatise.

2. TRADE MARKS AND THE THIRD DIMENSION

2.1. Life-Span of IPR Protection of Three-Dimensional Shapes

When a new product with a distinct shape is created, the primary form of IPR protection is usually copyright, which arises automatically, provided that the requirement for originality is fulfilled. The secondary form of protection is usually patent protection[39] or design right, which can be registered, but which protects also unregistered shapes. In case the shape is sufficiently distinct and original, design protection is a relatively easy and fast method of IPR protection, but of limited scope and duration.

Three-dimensional trade mark protection has not traditionally been understood as a form of protection for designs.[40] Still, it is usually the final and perpetual form of IPR protection for a shape that has withstood the test of time on the market, since it normally requires distinctive character in the form of a secondary meaning to be acquired through use. However, there is an enticing incentive for applying for trade mark protection; there is no time-limit for the duration of protection as long as it is used commercially. In practice, this means that three-dimensional trade mark protection is usually sought for "classic" products of sufficiently distinct shape, such as the Toblerone candy bar or the Lego figurine.[41]

This chapter will focus on trade mark protection of three-dimensional shapes and the special characteristics it encompasses. In order to properly evaluate the framework surrounding three-dimensional trade marks and the assessment of likelihood of confusion, some basics concerning the legal basis of trade mark protection, acquiring trade mark protection and the scope of protection acquired need to be set out first.

2.2. Legal Framework for the Protection of Trade Marks

When looking at trade marks on a territorial scope encompassing the area of the EU, relevant legislation can be found on three different institutional levels: international conventions, EU legislation and national legislation. The distinction based on the legal source is important to acknowledge in doctrinal legal scholarship, but it is equally important to note that the hierarchy is not always clear-cut. In some cases, it resembles more a dynamic ecosystem than a strict hierarchy; [42] especially in the level of international conventions, EU treaties and

[39] Note that patent protection requires that the invention has not yet reached the public domain. Therefore, patent protection needs to be applied for prior to introducing the goods on the market.
[40] Lilja 2012.
[41] See e.g. Oesch et al 2005, pp. 38–45 and 49–51.
[42] Tuori 2007, p. 286. *Tuori* has explained this diversification of legal norms as polycentricity (*polysentria*).

national constitutions. To some extent, a hierarchy exists since European trade mark law is bound by certain international conventions, which therefore guide its interpretation where applicable.[43] IP rights are protected as human and fundamental rights, therefore certain principles are applied when determining the scope of the rights conferred on the IP right proprietors and when balancing IP rights against other fundamental and human rights.[44]

On an international level, trade mark protection is based on international conventions such as the Paris convention,[45] the TRIPs Agreement,[46] the Trademark Law Treaty (TLT),[47] te Madrid Agreement[48] and the Protocol[49] relating to it. These conventions lay the foundations for the protection of trade marks along with other IPR rights.[50] In addition to these general conventions, more specific conventions have been adopted, for example the Nice and Vienna Agreements concerning the classification of goods and services.[51] Regarding the EU, one of the main objectives of the trade mark system of the European Union is a functioning internal market.[52] Said objective requires i.a. extensive harmonising of the trade mark legislations of the Member States.[53] This objective is apparent from Recital 10 of the preamble of the TMD, stating that it is essential for the Directive to ensure that registered trade marks enjoy the same protection under the legal systems of all the Member States.

[43] For example recital 41 of the preamble of the TMD recognises the fact that Member States are bound by the Paris convention for the Protection of Industrial Property and the TRIPs Agreement, resulting in a need for consistence with such conventions.
[44] On this matter see e.g. Geiger 2004 and Griffiths – McDonagh 2013. Protection of the proprietor's exclusive right is not absolute, thus it must be weighed against other basic and human rights such as freedom of speech and freedom to conduct a business and a proportionate balance must be struck between the conflicting rights and interests.
[45] Paris Convention for the Protection of Industrial Property of 1883.
[46] Trade-Related Aspects of Intellectual Property Rights, signed in Marrakesh, Morocco on 15 April 1994.
[47] WIPO Trademark Law Treaty, done at Geneva on October 27, 1994.
[48] Madrid Agreement Concerning the International Registration of Marks of April 14, 1891.
[49] Protocol Relating to the Madrid Agreement Concerning the International Registration of Marks, adopted at Madrid on June 27, 1989.
[50] Due to the common basis of trade mark law, trade mark legislation is somewhat similar in most jurisdictions around the world and arguments from different jurisdictions can therefore be employed in interpretation. Also, International trade mark systems such as the EU trade mark and International registration under the Madrid Protocol differ slightly from the territorial protection under national trade mark law, albeit mainly from a procedural perspective. Legal concepts such as likelihood of confusion are still understood in a similar manner in both types of trade mark systems.
[51] Nice Agreement Concerning the International Classification of Goods and Services for the Purposes of the Registration of Marks of June 15, 1957, as amended on September 28, 1979 and Vienna Agreement Establishing an International Classification of the Figurative Elements of Marks, done at Vienna on June 12, 1973, as amended on October 1, 1985.
[52] Article 3(3) TEU.
[53] Pakarinen 2006b, p. 43.

At the EU level, secondary legislation relevant to this study encompasses the aforementioned Trade Mark Directive and the Trade Mark Regulation.[54] The legal praxis of the CJEU and the EUIPO Board of Appeal,[55] plays an important role in the interpretation of the legislative instruments. The wording of the EU provisions in relation to likelihood of confusion is overly broad,[56] and the legal field of trade marks is widely harmonised in the EU and in an age of transition due to digitisation. Therefore, case law of the CJEU is crucial in guiding the interpretation of the law and is thus emphasised in this research.[57]

National legislation implemented by the Member States supports in part the system of the TMD. The TMD is not fully harmonising, so it leaves a certain amount of space for national legislators.[58] EU legal praxis is relevant to Member State authorities when it concerns the interpretation of the TMD. National courts have been relatively active in requesting preliminary rulings from the CJEU and using the justifications from previous judgments of the CJEU concerning the interpretation of the TMD. Even though the systems of TMD and TMR are separate and CJEU and BoA decisions and judgments on the interpretation of the TMR are not binding on the Member States as such, CJEU and BoA cases on interpretation of the TMR can also be used in interpreting similar provisions of the TMD due to the similarity of the TMD and TMR, and vice versa.[59] Due to the high demand for a uniform European trade mark law, EU trade mark law has gained more significance in the national level of Member States than what would have been required by formal norm hierarchy.[60] When applying CJEU cases in national trade mark law, one should acknowledge the fact that the significance of a CJEU judgment is dependent on the nature of the rule of law formulated by the court in each specific case. Due to the dynamic and teleological practice of the CJEU, each case and its relevance should be assessed *ad hoc*.[61]

[54] Trade marks registered under the TMR are protected in the whole EU and protection is gained by submitting a single application. Therefore, the system under the TMR is based on a wide notion of territoriality. Also, the system differs from that under the TMD insofar as unregistered trade marks are not protected under the TMR.
[55] The current EUIPO Board of Appeal was formerly known as OHIM Board of Appeal until 2016, when the new TMR entered into force.
[56] Morris 2012, p. 11.
[57] For example Palm has noted that the Finnish Trade Mark Act has implemented Article 10(2) TMD in such a wide wording that the TMD and CJEU case law can be taken directly into account in its interpretation to a significant extent. See Palm 2002, p. 140. See also Pihlajarinne 2012b, p. 551 and 558.
[58] For example see TMD preambles 2, 9 and 12.
[59] Pakarinen 2006b, p. 44.
[60] *Ibid*, pp. 44–45.
[61] Siltala 2003, pp. 287–289.

One characteristic of European trade mark law is the often incomplete implementation of the TMD into national legislation.[62] Doctrines such as primacy of EU law and interpretation to the furthest extent possible in order to realise EU law oblige Member States to interpret their national laws in conformity with the TMD. However, this does not apply to situations where national and EU law are in irresolvable conflict, i.e. the Member States are not under an obligation to arrive at *contra legem* interpretation of national trade mark law.[63] Due to this, the TMD is emphasised in this research, where national laws reflecting it are of less importance. A horizontal level also exists between Member States. National legal praxis, e.g. decisions taken by the Finnish Supreme Court, Courts of Appeal and the Supreme Administrative Court are binding in the Member State concerned, but decisions taken by courts in other Member States can also be used as persuasive arguments in another Member State, due to the nature of such judgments as so-called allowed legal sources.[64] *Pihlajarinne* has even suggested that European case law, even national judgments of the Member States, could be considered as weakly binding legal sources due to its scarcity and the rapid pace of change in the legal field owing to digitisation.[65]

2.3. Flexibility and Functions of Trade Mark Protection

The field of 3D printing is relatively unregulated. There are no specific regulations on EU or national level of Member States that would provide for the admissibility of 3D printing in different situations, but a significant amount of legislation can be extended to the newly emerged area of activities. Concerning trade marks, the legislation was not drafted with new fields of technological inventions such as 3D printing in mind, but the flexible construction of the law enables it to adapt to and extend its provisions on new emerging areas.[66] Due to the open wording of the Trade Mark Directive,[67] almost any kind of sign can be registered as a trade mark or established through use, provided that the mark fulfils certain criteria related to distinctiveness and capability of being represented.[68] In addition to "traditional" word or figurative trade marks, this encompasses i.a. marks in the form of three-dimensional

[62] See e.g. Finnish Government Bill HE 24/2016 vp, p. 8 on the inconsistency of the Finnish Trademarks Act with the TMD in relation to provisions concerning the scope of protection provided to trade mark proprietors.
[63] See e.g. Tridimas 2006, p. 30.
[64] Siltala 2003, pp. 200–201 and Tolonen 2003, pp. 126–127.
[65] Pihlajarinne 2012b, p. 558.
[66] Ebrahim 2016b, p. 40.
[67] According to Article 3 TMD: "[a] trade mark may consist of any signs". Article 4 TMR contains an identical provision.
[68] Trade mark protection is not limited by a closed list of certain types of marks such as e.g. copyright in the UK. Different types of trade marks are recognised, such as word, figurative and shape marks, but it is not required for a trade mark to fit into a certain type or class in order to gain protection.

shapes, colours or sounds. The broad array of possible marks used as trade marks provides for flexibility when it comes to protecting trade marks in the context of new emerging technology. Additionally, the doctrine of global assessment of all relevant circumstances employed in assessing likelihood of confusion allows for extensive flexibility in different and unforeseen situations.[69]

When assessing trade marks in a new and unforeseen technological environment, the basic principles and underlying functions of trade mark protection are placed in an emphasised position in order to prevent fragmentation of the field of law.[70] The language of trade mark legislation is relatively generic and has been drafted in an era when contemporary technological advancements have been unimaginable. Therefore, in adapting the language to the digital context, one needs to commence interpreting the norms from a principal level, taking into account the function of the norms. As *Pihlajarinne* has pointed out in the context of copyright, a mere formal inspection of the wording of the norms might easily lead to irrational and inconsistent outcomes in the digital context.[71] The functions are a useful tool for determining the scope of trade mark protection and interpreting legal norms.[72]

The main function of trade mark protection has traditionally been understood as indicating a certain anonymous economic origin of the goods or services, i.e. the origin function.[73] This "essential function" is supported by the quality or guarantee function, i.e. the function symbolising qualities associated with the goods or services and guaranteeing that the goods or services measure up to such expectations, and investment and advertisement functions, which concern the protection of investments of the proprietor in developing the goods or services and goodwill related thereto.[74] The separation function, i.e. separating the proprietor's goods or services from that of competitors based on the trade mark, can be seen to enable the origin function, and the origin function subsequently enables the quality

[69] Pihlajarinne 2012c, p. 389.
[70] *Ibid*, pp. 385–386.
[71] For example the copyright law concept of making copies is especially incompatible with the digital context, since almost all acts require the making of temporary or more permanent digital copies. See Pihlajarinne 2012a, p. 109.
[72] Pakarinen 2006a, p. 30.
[73] The origin function has been recognised by the CJEU already in the 70's; ee e.g. ECJ judgment in the case 102/77, *Hoffmann-La Roche & Co. AG v Centrafarm Vertriebsgesellschaft Pharmazeutischer Erzeugnisse mbH*, 23 May 1978, ECLI:EU:C:1978:108, para 7. For a more detailed analysis of the function see Simon 2005. It is noteworthy that recital 16 of the preamble of the new TMD also recognises the origin function as *absolute* in connection with protection against identity between the mark and the corresponding sign and the goods or services.
[74] Cornish – Llewellyn – Aplin 2013, pp. 643–644.

function as well as the investment or advertising functions.[75] The origin function, or the essential function of trade mark protection, determines the scope of core protection provided by trade mark legislation, guiding the interpretation of trade mark law and balancing trade marks against free movement and freedom to conduct a business, for instance.[76]

The scope of protection afforded under the essential function and the functions directly supporting it has been seen as too narrow, and European trade mark law has been under severe pressure from trade mark proprietors to extend the scope of protection.[77] Thus, additional functions such as the competition function have been argued to exist,[78] and such functions have been subsequently confirmed in CJEU case law. For example in the *Dior*[79] and *L'Oréal*[80] cases, the ECJ found that besides the main functions, trade marks possess i.a. the investment, advertisement and communication functions. The establishment of a trade mark requires investments in the form of good and consistent quality in order to achieve distinctiveness and so called *goodwill* in relation to consumers. Once a reputation of a brand is created, the proprietor is able to benefit from repeated purchases by customers and added sales.[81] Thus, the purpose of trade mark legislation is – besides indicating origin – to protect the goodwill that the proprietor and its goods or services gain through sales and marketing.[82] The protection of such additional functions, i.e. protecting the individual economic value of

[75] Pihlajarinne 2010, p. 53.
[76] Simon 2005, pp. 402–420.
[77] Pakarinen 2006a, p. 82. *Pakarinen* noted that the economic value of trade marks has also increased recently due to market development, resulting in a need for reassessment of the scope of protection afforded to trade marks.
[78] E.g. Salmi et al 2008, pp. 50–59. This reflects a change in how the role of trade marks is understood, from guiding consumers in making rational choices to encouraging consumers to make choices solely based on the appeal of the trade marks and the product. See Tarawneh 2016, p. 361.
[79] Judgment of the ECJ in the case C-337/95, *Parfums Christian Dior SA and Parfums Christian Dior BV v Evora BV*, 4 November 1997, ECLI:EU:C:1997:517, para 45. These functions are usually associated with luxury products.
[80] Judgment of the ECJ in the case C-487/07, *L'Oréal SA, Lancôme parfums et beauté & Cie SNC and Laboratoire Garnier & Cie v Bellure NV, Malaika Investments Ltd and Starion International Ltd*, 18 June 2009, ECLI:EU:C:2009:378, paras 58–59.
[81] Landes – Posner 2003, pp. 167–168. *Ebrahim* has criticised *Landes and Posner* for conflating the concepts of brand and trade mark. See Ebrahim 2016a, p. 38. This is an understandable critique and the concepts should be kept separate since they bear different meanings also in the European trade mark regime. Regarding the differences between the concepts from an European point of view see e.g. Yelnik 2010, p. 204.
[82] Salmi et al 2008, p. 59. *Lemley*, supported by *Ebrahim*, has suggested that brand protection should be preferred instead of restrictive trade mark protection due to the fact that digitisation and 3D printing have made economic scarcity obsolete by enabling zero marginal cost production, and artificially creating scarcity through trade mark protection will fail, similarly than the endeavours of copyright proprietors to stop copyright privacy through strict and draconian copyright enforcement. Brand creation and protection, on the other hand, is better suited for increasing product appeal and attracting consumers via emotional responses. See Lemley 2015, pp. 470–471 and 504–509 and Ebrahim 2016a, pp. 21–23 and 36–38. It should be noted that the views of the US scholars *Lemley* and *Ebrahim* are affected by the fact that the writers appear quite critical against the whole contemporary regime of IPR protection.

trade marks, extends the scope of protection afforded to trade marks, since the scope of protection should reflect the functions that trade marks possess on the market.[83]

Additionally, trade marks can be seen to possess an economic function since they are intangible property of the proprietor and can be freely transferred.[84] This transferability has, to some extent, severed the tie between the origin function and the trade mark and provided space for other functions protecting the independent economic value of the trade marks themselves, since fully transferable trade marks no longer indicate the exact origin of the goods or services but only an anonymous source.[85] It has been argued that 3D printing will further diminish this connection when consumers will be able to print their own versions of trade mark protected goods without any direct connection to the proprietor.[86] Divergent from other forms of IPR protection, the main purpose of trade mark protection is not the promotion of creativeness and innovation but the separation of the proprietor's goods and services from that of competitors.[87] This is also the main difference between trade marks and trade names, the latter protecting the exact source of goods or services.[88] The duration of trade mark protection is not time-restricted and the monopoly it provides the proprietor with can thus be perpetual.[89]

The CJEU has usually emphasised that even though the origin function does not indicate the exact economic origin of the goods or services, it signifies that a certain economic operator has overseen the manufacturing of the products, connecting the origin function to the guarantee function.[90] This connection between the functions might be even more important in relation to 3D printing, since identical or almost identical goods can in principle be printed by anyone with the same or similar CAD file and a proper 3D printer. This

[83] Pihlajarinne 2010, p. 57. *Pakarinen* has expressed concerns relating to over-extending the scope of trade mark protection, since much of the relevant discussion on the matter has been emphasised by views of trade mark proprietors and their representatives. According to *Pakarinen*, affording overly extensive protection for trade marks is not likely to lead to an optimal outcome from the perspective of the economy and competition, and is likely to conflict with public interest. See Pakarinen p. 84.
[84] Salmi et al 2008, p. 56. Arguably, trade marks have become valuable economic assets in their own right, their respective value being determined by their selling power instead of ability to indicate source and quality. See e.g. Tarawneh 2016, p. 359.
[85] Pihlajarinne 2010, pp. 55–57.
[86] Grace 2014, p. 265. In consumer 3D printing, the proprietor of the shape mark can e.g. provide the consumer with the CAD file and the configuration of the printer and used material are left to the consumer.
[87] Salmi et al 2008. p. 61. Trade marks do promote innovation indirectly to some extent, since the creation of distinctive marks is rewarded with protection afforded to the mark against copying, resulting in monopoly rights to use the mark.
[88] Pihlajarinne 2010, p. 115.
[89] Jehoram – Van Nispen – Huydecoper 2010, p. 7.
[90] E.g. judgments of the ECJ in cases C-206/01, *Arsenal Football Club plc v Matthew Reed*, 12 November 2002, ECLI:EU:C:2002:651 and C-48/05, *Adam Opel AG v Autec AG*, 25 January 2007, ECLI:EU:C:2007:55.

decentralised nature of possible infringements in the context of 3D printing adds another complication to the enforcement of IPR such as trade mark rights in the field.[91] Once a CAD file is in the public domain, e.g. in an internet repository, the proprietor's possibilities to control 3D printing can be non-existent.[92]

To conclude the above subsection, the origin function – or the essential function – is the most important function of trade mark protection at present. It is understood in a broad manner, encompassing the separation and quality functions. Additional functions such as the investment, advertisement and communication functions are also protected to some extent, but their respective scope of protection is still unclear and thus of less significance compared to the essential function in general.[93]

2.4. Protecting Shapes: Acquiring Trade Mark Protection

Trade mark protection can be acquired in two different ways. A trade mark can be registered or an unregistered trade mark right can be acquired through use.[94] When applying for registration of a trade mark or claiming protection for an unregistered mark, the existence of possible absolute or relative grounds of refusal or invalidity may prevent registration or render a sign incapable of being protected as a trade mark. Said requirements are apparent in Article 4(1) TMD and Article 7(1) TMR and thus reflected in the absolute grounds for refusal or invalidity, which encompass i.a. marks that lack the requirements for constituting a trade mark and marks that are devoid of any distinctive character.[95] In case an absolute ground for refusal or invalidity applies, the registration of a trade mark shall be refused by the registrar *ex officio*.

---

[91] Depoorter 2014, p. 1493.

[92] Ballardini – Norrgård – Minssen 2015, p. 855. See Subsection 4.4.2 below regarding the use of digital verification or DRM measures in order to ensure authenticity of the design files and enforce trade mark rights.

[93] Pihlajarinne 2010, p. 62. The US scholar *Scardamaglia* has suggested that at least in relation to shape marks, a re-evaluation of the functions of trade mark protection beyond the economic function of indicating origin might be in place due to the change in the market owing to 3D printing. Similarly, other US scholars *Desai and Magliocca* have argued that as 3D printing becomes more widespread, consumers will be less inclined to believe that a trademark represents the source of origin. See Scardamaglia 2015, p. 44 and Desai – Magliocca 2014, pp. 1712–1713.

[94] Folliard-Monguiral – Rogers 2003, p. 170. Note that EU trade marks are only protected when registered.

[95] As *Jehoram et al* have pointed out, in order to be protected as a trade mark a sign needs to possess distinctive character and be able to constitute a trade mark, and these two requirements need to be separated dogmatically. Jehoram – Van Nispen – Huydecoper 2010, p. 69 and para 5.14.1. Other absolute grounds include i.a. shapes consisting exclusively of the nature of the goods, necessary for obtaining a technical result and giving substantial value to the goods. See e.g. judgments of the ECJ in cases C-321/03, *Dyson Ltd v Registrar of Trade Marks*, 25 January 2007, ECLI:EU:C:2007:51, C-299/99, *Koninklijke Philips Electronics NV v Remington Consumer Products Ltd*, 18 June 2002, ECLI:EU:C:2002:377 and judgment of the GC in the case T-508/08, *Bang & Olufsen A/S v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 6 October 2011, ECLI:EU:T:2011:575.

Relative grounds for refusal or invalidity are set out in Article 5 TMD and Article 8 TMR. Such grounds encompass i.a. the use of a trade mark prohibited by virtue of an earlier right, where an earlier right capable of preventing the registration of a junior mark or rendering a registered mark invalid includes e.g. an industrial property right. This is where likelihood of confusion can be claimed, preventing registration of a mark similar to the earlier mark.[96]

2.5. Three-Dimensional Trade Marks: A Special Case?

In relation to uncommon trade marks such as three-dimensional marks, several aspects need to be considered. Firstly, one needs to consider how uncommon trade marks differ from traditional marks, and how they fulfil the essential function, i.e. how they individualise the anonymous economic origin of the goods or services. Furthermore, one should consider how extensive the scope of protection afforded to three-dimensional trade marks should be and any consequent competition-related problems that might occur.[97] Three-dimensional trade marks can appear in different forms that include i.a. shape marks comprised of the shape of the product itself, marks comprised of the shape of the product's packaging or three-dimensional marks used in connection with offering of the main product or service (e.g. the Michelin man).[98]

Three-dimensional trade marks face some difficulties when compared to traditional word or figurative marks. Shapes possess a lesser ability to individualise an anonymous economic origin, thus the protection of which leads to wider restrictions on the freedom of action of competitors.[99] Overly extensive protection of less distinguishable shapes of products or packaging can easily lead to distortion of competition and extensive barriers for entry into the market, especially if there are no viable options for the specific shape.[100] On the other hand, the availability of three-dimensional trade mark protection promotes efficiency in

[96] In case of a relative ground for refusal or invalidity, the registration can be refused or declared invalid by the registrar provided that the proprietor of an earlier trade mark takes active measures and opposes the registration of a later mark.
[97] The main question thereby addressed is whether the subject of protection sought is the distinguishable trade mark or the product itself. See Palm 2002, pp. 63–66.
[98] Salmi et al 2008, p. 207.
[99] See joined opinion of Advocate General Ruiz-Jarabo Colomer in the joined cases C-456/01 P and C-457/01 P, *Henkel KGaA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)* and C-468/01 P to C-474/01 P, *Procter & Gamble Company v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 6 November 2003, ECLI:EU:C:2003:602, para 69.
[100] Palm 2002, p. 80. Also, since trade mark protection is not time-restricted, perpetual trade mark protection of three-dimensional shapes can amount to tensions between the systems of trade mark and patent or design rights. Trade mark protection should not be used to circumvent the limited period of protection afforded to patents or design rights. See Palm 2002, p. 63.

marketing investments and the development of distinctive product designs.[101] Three-dimensional trade marks are assessed in the same manner as other types of trade marks, which means that in order to be registrable as trade marks, they need to fulfil certain criteria, mainly related to distinctive character and capability of being represented.[102]

2.5.1. Capability of Being Represented

The wording of the previous Trade Mark Directive[103] and the wording of Article 4 TMR require trade marks to be able to be represented graphically, i.e. representation of the trade mark as graphics or photographs. The new TMD no longer requires this, but it only requires capability of being represented on the register.[104] Finnish trade mark legislation for example is improperly implemented as it stands, since it still requires trade marks to be represented graphically. Interpretation in conformity with EU law might oblige Member States to interpret graphical representation as representation on the register.[105] The ECJ has held that the object of the requirement is to define the mark itself in order to determine the precise subject of the protection afforded by the registered mark to its proprietor. In order for this to materialise, users of the trade mark register need to be able to determine the precise nature and characteristics of a mark on the basis of its registration. This also determines the scope of the exclusive right. Thus, the graphic representation of the three-dimensional shape in the trade mark register must be self-contained, easily accessible and intelligible.[106]

According to the ECJ in *Sieckmann*, concerning the protection of an olfactory trade mark, verbal characterisation of the mark is not sufficient.[107] Furthermore, a mere verbal description of the shape is not enough, since representation without the need for former knowledge of the product is required.[108] Since three-dimensional trade marks are inherently different from traditional forms of trade marks, the requirement of being represented needs

[101] Palm 2002, p. 63.
[102] Judgment of the ECJ in the joined cases C-53/01 to C-55/01, *Linde AG* (C-53/01), *Winward Industries Inc.* (C-54/01) *and Rado Uhren AG* (C-55/01), 8 April 2003, ECLI:EU:C:2003:206, paras 42–49.
[103] Article 2 of the Directive 2008/95/EC of the European Parliament and of the Council of 22 October 2008 to approximate the laws of the Member States relating to trade marks.
[104] Article 3(1)(b) Trade Mark Directive.
[105] Note that the implementation period of the Directive has not yet expired, Member States have until 14 January 2019 or 14 January 2023 to implement certain parts of the Directive. Therefore, no obligation to interpret the TMD as it is exists before that date. For example in Finland, a working party preparing the implementation of the TMD was appointed on 22 June 2016.
[106] Judgment of the ECJ in the case C-273/00, *Ralf Sieckmann v Deutsches Patent- und Markenamt*, 12 December 2002, ECLI:EU:C:2002:748, paras 48 and 52.
[107] *Ibid*, paras 70 and 72. *Shield Mark* confirmed the interpretation in Sieckmann and its application to other types of trade marks not capable of visual perception as such. See judgment of the ECJ in the case C-283/01, *Shield Mark BV v Joost Kist h.o.d.n. Memex*, 27 November 2003, ECLI:EU:C:2003:641, para 56.
[108] Cornish – Llewelyn – Aplin 2013, p. 712.

to be fulfilled by more than a single photograph or graphic representation from one perspective since a three-dimensional shape cannot be properly perceived without additional perspectives of the object.[109]

Since Article 3(1)(b) TMD requires a trade mark to be capable of "being represented on the register", the question arises whether CAD files could fulfil this requirement in the future or not.[110] The preamble of the TMD states that it is an essential requirement that a sign is capable of being represented in a manner which is "clear, precise, self-contained, easily accessible, intelligible, durable and objective."[111] Therefore, a sign should be permitted to be represented "in any appropriate form using generally available technology, and thus not necessarily by graphic means", as long as the said requirements are met.[112] In principle, this would enable the use of CAD files as representations of the three-dimensional trade mark.[113] CAD files would enable the clear and precise perception of a three-dimensional shape in an intelligible and objective manner since the user inspecting the CAD file would be able to freely rotate the shape and perceive it from all possible perspectives as well as zoom in and out.[114] This would exclude the need for graphic illustration from several different angles. When a shape is represented graphically, ambiguities may remain regarding the details of the shape since presenting a three-dimensional shape in two-dimensional pictures or graphics will be unequivocal only in relation to relatively simple shapes. This might pose problems in relation to 3D printing, which enables extremely sophisticated and complicated shapes and structures. The directive has not yet been implemented as such in the Member States, and national legislation still requires graphic representation.[115] The matter is ultimately best left for future case law and national implementation to determine.

---

[109] For example, in the system of EU trade marks under the TMR, the requirement of being represented graphically can be demonstrated by using a maximum of six different perspectives of the shape, either by photographic reproduction or a graphic representation. See Commission Regulation (EC) No 2868/95 of 13 December 1995 implementing Council Regulation (EC) No 40/94 on the Community trade mark, as amended by Regulation (EU) 2015/2424 of the European Parliament and of the Council of 16 December 2015, rule 3, paragraph 4.

[110] For a more extensive analysis on CAD files, see Subsection 3.1 below.

[111] Recital 13 of the Preamble of the TMD.

[112] *Ibid*.

[113] It should be noted that the main rationale behind the legislative change is to facilitate the registration of e.g. olfactory, sound and taste marks. Shape marks can be represented graphically, but representation as a CAD file would enable a more specific representation of the shape and thus determining the respective scope of protection in a more specific manner.

[114] Some questions concerning the self-containability, easy accessibility and durability of CAD files remain, but this falls outside the scope of this research and cannot be further evaluated.

[115] See for example Section 1(1) of the UK Trade Marks Act 1994 and Section 8(1) of the German Act on the Protection of Trade Marks and other Symbols of 25 October 1994. The deadline for the Member States for implementing Article 3(1)(b) TMD expires on 14 January 2019.

2.5.2. Distinctive Character of Shapes

The essential function of trade marks, the origin function, encompasses the idea that the purpose of the trade mark is to separate between manufacturers of commercial goods. In relation to this function, distinctiveness plays an important role.[116] Distinctive character bears importance on several fronts since it is an absolute ground for refusal or invalidity or trade mark registration and it is also an important factor in the assessment of likelihood of confusion.[117] The latter is stems from the fact that the likelihood of confusion is greater when the earlier trade mark possesses a more distinctive character,[118] and since trade marks with a highly distinctive character enjoy a wider range of protection than marks with a less distinctive character,[119] and vice versa. Reference to a specific company is not required, it is sufficient that the public associates the mark with an anonymous source of the goods.[120] Distinctive character also benefits customers since it is understood as a means for consumers to separate different products from another, diminishing search costs.[121]

The level of distinctiveness varies depending on the characteristics of the mark and determines the scope of protection provided by the trade mark. Highly distinguishable marks are referred to as "strong" marks, whereas marks with a lower level of distinctive character, such as marks indirectly referring to the goods or its characteristics, are referred to as "weak" marks.[122] The weaker the trade mark, the narrower and more confined to protection against identical marks the scope of protection becomes. *E contrario*, stronger marks enable protection against marks with less similarity compared to the senior mark.[123] This affects also the assessment of likelihood of confusion, where confusion is found likelier in connection with marks with a high level of distinctive character.

---

[116] The ECJ noted in *SAT.1* that the underlying purpose of the test for distinctive character is to ensure the application of the essential origin function of trade marks, i.e. distinguishing the product or service from others which have another origin. See judgment of the ECJ in the case C-329/02 P, *SAT.1 SatellitenFernsehen GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 16 September 2004, ECLI:EU:C:2004:532, paras 23 and 27.

[117] EUIPO Guidelines for Examination of EU Trade Marks 2017, Part C, Section 2, Chapter 1, p. 7.

[118] Judgment of the ECJ in the case C-251/95, *SABEL BV v Puma AG, Rudolf Dassler Sport*, 11 November 1997, ECLI:EU:C:1997:528, para 24.

[119] Judgment of the ECJ in the case C-39/97, *Canon Kabushiki Kaisha v Metro-Goldwyn-Mayer Inc., formerly Pathe Communications Corporation*, 29 September 1998, ECLI:EU:C:1998:442, para 18.

[120] Judgment of the GC in the case T-337/99, *Henkel KGaA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 19 September 2001, ECLI:EU:T:2001:221, para 43.

[121] Judgment of the ECJ in the case C-173/04 P, *Deutsche SiSi-Werke GmbH & Co. Betriebs KG v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 12 January 2006, ECLI:EU:C:2006:20, para 60. For a more profound discussion on the significance of diminishing consumers' search costs in the digital context in relation to trade marks on both sides of the Atlantic, see Gillieron 2008.

[122] Jehoram – Van Nispen – Huydecoper 2010, para 5.14.2 and Salmi et al 2008, p. 151.

[123] Salmi et al 2008, p. 151–153.

The main principle is that all types of trade marks are evaluated in accordance with the same rules and principles. Since the TMD and TMR do not distinguish between different categories of trade marks, the criteria for assessing the distinctive character of three-dimensional trade marks consisting of the shape of the product itself are no different from those applicable to other categories of trade marks.[124] However, acknowledging the fact that the perception of the relevant section of the public is not necessarily the same in relation to a three-dimensional mark consisting of i.a. the shape of the product itself as it is in relation to a word or a figurative mark, it is quite clear that this notion similar rules is at least partially defective. In general, the public is used to recognising the latter marks instantly as signs identifying the product, but this is not necessarily so where the sign is indistinguishable from the appearance of the product itself.[125]

In practice, demonstrating distinctive character for shape marks is particularly difficult.[126] It is therefore clear that three-dimensional trade marks are under different requirements compared to traditional types of trade marks. Therefore, in 2004 the ECJ gave out its landmark judgment in *Henkel*, laying out the test for distinctiveness of shapes, also commonly referred to as the Henkel test. According to the test, only a trade mark which *significantly* departs from the norm or customs of the sector and thereby fulfils its essential original function is not devoid of distinctive character.[127] Thus, the evaluation of distinctiveness in relation to shapes takes place on two different level. Firstly, by reference to the products or services in respect of which registration has been applied for or other similar goods in the market and, secondly, by reference to the consumers' ability to draw distinctions between products, i.e. the perception of the relevant public, which consists of average consumers of the products or services in question, who are reasonably well

[124] *Philips*, para 48.
[125] Judgment of the ECJ in the joined cases C-468/01 P to C-472/01 P, *Procter & Gamble Company v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 29 April 2004, ECLI:EU:C:2004:259, para, para 36. Conflicting views have been presented in legal literature on the matter. For example *Cornish et al* have argued that it is simply wrong to equate shape marks with logos or words when considering distinctive character, since in the real world, shapes do not function to indicate origin without education or use as such. On the other hand, *Phillips* has justifiably argued that it would seem unrealistic to claim that product shapes can never be an indicator of source. Due to this, shape marks and other specific categories of trade marks can be inherently distinctive as a mark only in exceptional circumstances, and usually require considerable evidence of distinctive character and use on the market prior to registration. See Cornish – Llewelyn – Aplin 2013, pp. 727–729 and Phillips 2003, p. 146. See also Subsection 2.5.3 below.
[126] Cook 2014, p. 424. This has been quite apparent in ECJ cases such as C-218/01, *Henkel KGaA*, 12 February 2004, ECLI:EU:C:2004:88 and C-136/02 P, *Mag Instrument Inc. v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 7 October 2004, ECLI:EU:C:2004:592.
[127] *Henkel*, para 49.

informed and reasonably observant and circumspect.[128] The test is the only test to be made in the assessment, and no additional requirements can be imposed on the registrability of shapes.[129]

The ECJ has further elaborated the matter in a series of cases. In *Mag Instrument*, the ECJ found that a mere variation of a general shape in the market is devoid of any distinctive character and cannot gain the status of a trade mark.[130] The more practical and common a shape is, the higher the threshold for protecting it.[131] Also, the level of assessment can vary in relation to the goods in question; in *Deutsche SiSi-Werke*, the ECJ held that a wider sector of goods of other similar product groups could be taken into account in the assessment.[132] Distinctiveness can be found in comparison with other similar goods on the market or in comparison with other goods in the same general class of goods for which registration has been applied.[133] However, the goods or services for which the trade mark is applied for are primary in the assessment.[134]

The level of consumer awareness has been found to differ i.a. in connection with different types of products or products of different price range, since consumers are more prone to notice differences in the shapes of more expensive products.[135] For example in *Eurocool*,

[128] Kukkonen 2010, p. 223 and e.g. judgment of the ECJ in the case C‑363/99, *Koninklijke KPN Nederland NV v Benelux-Merkenbureau*, 12 February 2004, ECLI:EU:C:2004:86, para 34.
[129] Judgment of the ECJ in the case C-24/05 P, *August Storck KG v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 22 June 2006, ECLI:EU:C:2006:421, para 28. Note that the distinctiveness of three-dimensional trade marks is evaluated based on the shape *per se*, or the "naked shape", without etiquettes or other word or figurative elements. See decision of the OHIM BoA in the case R 488/1999-2, H. J. Heinz Company, Limited, 3 August 2000, para 29. The shape of a product might lose distinctiveness in the eyes of consumers when combined with strong and distinctive word or figurative marks in the same product or packaging. See Phillips 2003, p. 153 and e.g. judgment of the GC in the case T-316/00, *Viking-Umwelttechnik GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 25 September 2002, ECLI:EU:T:2002:225, paras 36–37.
[130] *Mag Instrument*, para 32. *Kukkonen* has pointed out that if the shape of the product lacks distinctiveness, consumers see the shape as a character of the product instead of a "seal of origin". See Kukkonen 2010, p. 232.
[131] Palm 2002, pp. 89–90.
[132] *Deutsche SiSi-Werke*, paras 32–33 and 36.
[133] See e.g. decisions of the BoA in the cases R 373/2006-2, *Philip Morris Product S.A.*, 14 July 2006, paras 15 and 21–24, R 75/2005-4, *Philip Morris Product S.A.*, 24 February 2006, paras 17–19 and order of the ECJ in the case C-497/07 P, *Philip Morris Products SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 27 June 2008, ECLI:EU:C:2008:372, where the shape of a tobacco package was granted trade mark protection in the class of tobacco products but registration in the class of packaging was refused.
[134] Judgment of the GC in the case T-315/03, *Hans-Peter Wilfer v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 8 June 2005, ECLI:EU:T:2005:211, paras 68–75. The judgment of the GC was confirmed by the ECJ in the case C-301/05 P, *Hans-Peter Wilfer v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 11 October 2007, ECLI:EU:C:2007:593.
[135] Kukkonen 2010, p. 227. See e.g. judgment of the ECJ in the case C-361/04 P, *Claude Ruiz-Picasso and Others v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 12 January 2006, ECLI:EU:C:2006:25, paras 41–42.

the services in question were intended for professionals working in the food industry or the hotel business, which meant that the relevant public was deemed to be composed of informed, observant and circumspect specialists.[136] Thus, the shape of more affordable products such as washing liquid bottles cannot usually possess sufficient distinctive character, since the different shapes are not perceived as identifying the brand, and more expensive perfume bottles usually have a distinct shape that is as important as word marks or logos.[137]

2.5.3. Inherently Distinctive Shapes and Distinctiveness Acquired Through Use

Due to the open wording of the TMD and TMR, registering a three-dimensional trade mark is in principle possible based on *ab initio* distinctive character, i.e. without acquiring distinctiveness through prior use.[138] Some scholars have, however, argued that a shape could not *ab initio* constitute a trade mark without first acquiring distinctiveness through use, since a shape is not normally seen as a trade mark and granting trade mark protection for shapes would result in an "eternal design right" protecting the product itself and not the origin function.[139]

In practice, distinctiveness is mainly acquired through use.[140] A shape mark can acquire distinctive character through consistent use of the mark on the market, where the mark acquires a secondary meaning.[141] This can be achieved for example in cases where the applicant has been the only trader in such articles.[142] The ECJ has required concrete and

---

[136] Judgment of the GC in the case T-34/00, *Eurocool Logistik GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 27 February 2002, ECLI:EU:T:2002:41, para 47.

[137] See Phillips 2003, pp. 66–67 and e.g. decision of the OHIM BoA in the case R 476/2001-3, Eurocos Cosmetic GmbH, 7 August 2001, para 23. In its decision, the BoA also took into account the existence of a great range of different forms of container shapes present on the market.

[138] See judgment of the ECJ in the case C-215/14, *Société de Produits Nestlé SA v Cadbury UK Ltd*, 16 September 2015, ECLI:EU:C:2015:604, para 62 and Palm 2002, p. 86.

[139] See e.g. Palm 2002, p. 88 and Davis et al 2014, p. 486. In the UK, Justice Jacob suggested that registering unusual shapes without proof of use was "fundamentally undesirable", since trade mark registries would in effect be acting as design registries, granting perpetual monopolies on certain shapes. This view has been supported by i.a. *Cornish et al*. See UK High Court of Justice (Chancery Division) case *Société de Produits Nestlé SA v Unilever Plc* [2003] E.T.M.R. 53, 18 December 2002, para 18 and Cornish – Llewelyn – Aplin 2013, p. 728. However, the ECJ has not accepted these views and has confirmed the fact that a shape can possess intrinsic distinctive character. Due to a wide range of situations, this would seem the more reasonable interpretation since a complete refusal to register shapes would seem unreasonable in relation to some goods or services. See *ibid.*

[140] Cook 2014, p. 423. It should be noted, however, that acquiring a three-dimensional trade mark through use is not possible when any of the situations in Article 4(1)(e) TMD or 7(1)(e) TMR apply; e.g. functional shapes cannot be monopolised by a trade mark right regardless of how extensively it has been used on the market. See Cornish – Llewelyn – Aplin 2013, p. 728 and *Philips*, para 75.

[141] Jehoram – Van Nispen – Huydecoper 2010, para 5.14.15.

[142] *Philips*, para 65. In *Mag Instrument*, the ECJ held that distinctive character may be acquired i.a. through familiarising the relevant public to the goods or services in question. See *Mag Instrument*, para 47.

reliable information regarding use of the mark, and all circumstances in which the relevant public may see the mark must be taken into account in the assessment.[143] Relevant factors in assessing whether distinctive character has been acquired through use include the market share of the mark, the intensity, geographical spread and duration of the mark's use, scope of investments made in order to promote the mark, proportion of the relevant public that recognises the mark and statements from chambers of commerce and industry or other trade and professional associations.[144] According to the ECJ in *August Storck*, a three-dimensional shape can acquire distinctiveness through use even when it is used in conjunction with a figurative or a word mark.[145]

[143] *August Storck*, paras 71 and 75.
[144] Judgment of the ECJ in the case C-25/05 P, *August Storck KG v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 22 June 2006, ECLI:EU:C:2006:422, para 75. Note that market share of the mark carries significant weight in the assessment, but cannot establish distinctive character acquired through use alone without additional evidence. See e.g. Jehoram – Van Nispen – Huydecoper 2010, para 5.14.15.2.
[145] See *August Storck*, paras 59–60.

3. 3D PRINTING TECHNOLOGY

As already mentioned above in the introduction, 3D printing, or additive manufacturing, is a method of creating a physical object by adding thin layers on top of each other. Without going too deep into technical details, certain basic characteristics of the technology need to be inspected for the object of this research inquiry. First and foremost, one needs to be aware of the fact that there is a vast array of different 3D printing techniques with differentiating fundamental techniques. 3D Printing is just an umbrella term for a method of manufacturing by adding layer upon layer. The main branches of 3D printing technology employ vat photopolymerisation, material extrusion, material jetting, binder jetting, powder bed fusion, direct energy deposition and sheet lamination.[146] In addition to the technological perspective, one should be aware of the new business models emerging around the technology as well.[147]

3.1. CAD Files

Before venturing into the different methods of 3D manufacturing, CAD files should be first looked into, since the whole process of 3D printing begins from the design file, and cannot be carried out without one. As already mentioned, CAD files are the digital representation of the object to be printed. It is a digital blueprint, which contains directions for the printer on how to create the physical product, a roadmap of sorts.[148] In practice, they contain the x, y and z coordinates how the object is built, layer upon layer.[149] Without the CAD file, the 3D printer would not know where to solidify, extrude, sinter or jet material and in what sequence.

CAD files can be purchased from a designer or acquired from an online repository. They can also be created from scratch with certain computer software or through scanning an

[146] 3DHubs: What is 3D Printing <https://www.3dhubs.com/what-is-3d-printing>, last visited on 9 March 2017.

[147] For example *Ebrahim* has divided the emerging business models into five different main categories: printer and equipment manufacturing, printing intermediaries, software tools, marketplaces, e-commerce sites, and repositories of 3D printable CAD files, and information technology and service oriented solutions utilising 3D printing. See Ebrahim 2016a, p. 10. Said business models possess unique characteristics compared to one another as well as conventional business models that can be relevant in assessing likelihood of confusion, e.g. in relation to distribution channels or relevant public. Therefore, the global appreciation of all relevant circumstances is a functional tool in taking such characteristics into account.

[148] Ballardini – Norrgård – Minssen 2015, p. 850.

[149] When a solid shape is translated into feasible instructions for the 3D printer, the shape needs to be processed with certain slicer software that slices the solid shape into printable layers and configures the optimal route for the printer head. CAD files obtained from e.g. online repositories can thus be already sliced, but usually need slicing prior to printing. See Evans 2012, pp. 37–38 and 55–56 and Lipson – Kurman 2013, pp. 87–103.

existing object with a 3D scanner.[150] Due to their nature as digital files, CAD plans are easily copied and distributed online.[151] Once a CAD file is created and uploaded to the internet, it is essentially available to the whole world.[152] Due to this, 3D printing has been suggested to separate creation from distribution.[153] The CAD file can easily be adapted or altered, enabling endless possibilities for individualisation and complex designs.[154] However, due to the process of building an object layer upon layer, the CAD file needs to be designed so that it provides the 3D printer feasible instructions on how to build the object.[155]

3.2. Different Technologies of 3D Printing

There are a lot of different processes that implement additive manufacturing, but all of the processes are founded on a layer-based approach. There are also differences in how the layers are formed and bound to the previous layers.[156] The main types of processes include vat photopolymerisation, material extrusion, powder bed fusion, material jetting, direct energy deposition and sheet lamination. A short overview of each main type of process is provided below.

In vat photopolymerisation, a liquid photosensitive resin is selectively cured, or solidified, in layers by using a light source. The light source can be a laser or a projector, depending on the technology used. For example stereolithiography (SLA), which was patented in 1986 is based on this method. Vat photopolymerisation produces objects with a smooth surface and accurate finishing, but the material used is limited to certain types of photopolymer resins with varying flexibility and durability.[157]

Material extrusion, or fused deposition modelling (FDM), is the cheapest and the most commonly used form of 3D printing. With this method a solid line of filament, a thermoplastic polymer, is melted and extruded through a nozzle following a certain path, creating instantly solidifying layers. The range of raw materials that can be used with FDM

[150] Van der Berg 2016, p. 15.
[151] This poses a threat to traditional internet-based business-to-consumer business models, since it is cheaper and in some cases even easier for consumers to obtain the CAD file and print the product themselves than purchase it from the manufacturer. Also the production of counterfeit goods is made easier by 3D printing. See e.g. Ebrahim 2016a, p. 23.
[152] Van der Berg 2016, p. 18.
[153] Ebrahim 2016a, p. 19.
[154] See e.g. Mathias – Rao 2015, p. 552.
[155] On basics of CAD design, see e.g. Larson 2013, pp. 6–9.
[156] Barnatt 2016, p. 3.
[157] Lipson – Kurman 2013, p. 73.

technology is vast and the method can also be used in the creation of functional and complex end products such as electronics.[158] Since the term fused deposition modelling is a protected trade mark in the US, the same process is sometimes also referred to as fused filament fabrication (FFF).[159]

Powder bed fusion techniques use a high-powered laser or electron beam that selectively melts or sinters powdered material layer by layer. The technique is similar to binder jetting since it also requires the spreading of powder for each layer. The variety of different materials include different plastics and metals, and the possibilities of different designs are wide, due to excess powdered material acting as support for the structure as it is constructed. Each produced object is limited to a certain colour and material, but the resulting product is relatively strong. As mentioned above, this technique enables the printing of metal products, and is mainly used in industrial applications.[160]

Material jetting techniques jet layers of liquid photopolymer onto a build tray, instantly curing the layers by using a light source as they are jetted. This technique enables finer details and precision than other technologies at present. Advanced printers can even use multiple different materials simultaneously for a combination of different colours and characteristics.[161] In binder jetting methods, which are similar to material jetting and powder bed fusion, a binding agent such as glue is selectively dropped on a bed of powdered material, typically sandstone, in order to form a layer. A new thin layer of powder is subsequently spread on the previous one and the same process is repeated. After the printing process, the product is coated with an adhesive glue for strength and to make it resistant to discoloration. This technique allows for printing in full colour and in complex shapes, but the final product lacks in strength.[162]

In direct energy deposition powdered material is blown into a focused laser beam, where powdered particles that hit the focal point of the laser beam melt and add to the structure. This process can use metals and other hard materials, and several parallel nozzles can be used to spray different types of material into the same structure in controllable ratios.[163]

---

[158] 3DHubs: What is 3D Printing <https://www.3dhubs.com/what-is-3d-printing#technologies>, last visited on 9 March 2017.
[159] Banwatt 2013.
[160] 3DHubs: What is 3D Printing <https://www.3dhubs.com/what-is-3d-printing#technologies>, last visited on 9 March 2017.
[161] *ibid.*
[162] *ibid.*
[163] Lipson – Kurman 2013, pp. 71–72.

Finally, sheet lamination, or laminated object manufacturing (LOM), uses a slightly different approach. In LOM, shapes are cut out from a sheet of raw material and combined with the previous layers with a binding agent such as glue. This technology can exploit i.a. metal foils, plastic sheets and paper.[164]

3.3. Materials

As it became apparent in the previous section, the array of different materials that can be used in 3D printing is also notably wide. At the moment, there are hundreds of different materials with different properties and functionalities.[165] Each material used for 3D printing is different and possesses different characteristics. Materials can be flexible or solid, brittle or strong, smooth or rough, heavy or light etc. Due to this, the material plays an essential part in producing the object and needs to be acknowledged also in designing the print. To name just a few, the most widely used materials today include plastics such as acrylonitrile butadiene styrene (ABS), nylon and polylactic acid (PLA), metals such as stainless steel, aluminium or gold, ceramics, paper, bio materials, food and other materials such as concrete.[166]

3.4. Characteristics of 3D Printing and 3D Printed Products

Due to the fact that the technology is based on layers being added on top of one another, the layers are usually visible from the printed object. Assessing the printers on an x-, y- and z-three-dimensional axis,[167] the horizontal resolution of the print on the x- and the y-axis determines the smallest movement the printer's extruder can make within a layer, i.e. the level of horizontal detail on a single layer. The lower the value of horizontal resolution, the higher the level of details produced by the printer. Vertical resolution refers to the minimal thickness of a single layer that the printer produces. Thinner layers will result in smoother printed surface and less visible layering.[168] However, since thinner layers increase the number of total layers required, the printing process will take longer.[169] This is due to the fact that e.g. in FDM, the printing speed of the printer's extruder remains usually constant

[164] Lipson – Kurman 2013, pp. 72–73.
[165] McCue 2017.
[166] See e.g. 3DPrinting Industry: The Free Beginner's Guide: 3D Printing Materials, <https://3dprintingindustry.com/3d-printing-basics-free-beginners-guide/materials/>, last visited on 4 April 2017.
[167] The most common type of FDM printers is the "cartesian" printer which moves its extruder in three linear directions along the x- y- and z-axes. See e.g. Evans 2012, pp. 2–3.
[168] Evans 2012, pp. 60–61.
[169] See e.g. Grieser 2015. Also the infill of the printed object considerably affects the total print time. Printing a solid object takes more time compared to a hollow object. See Evans 2012, p. 59–60.

and in powder bed fusion techniques the creation of a single powder bed layer takes always about the same time.[170]

Much is also dependent on the printing method used.[171] The thickness of the layers varies depending on the printing method and the quality of the printer. For a reasonably-priced professional SLA desktop printer the highest resolution can be as thin as 25 microns, or 0.025 mm.[172] In general, SLA produces finer details than FDM or FFF due to the different printing method, even if the SLA printer is set to the same vertical resolution as a FDM printer.[173] The surface is also sometimes sanded or otherwise treated after printing, thus a layered surface might not be all that visible in every 3D printed product.

The benefits of 3D printing include first and foremost the vast variety in product designs. Adjusting a design and individualisation is easy and complexity is "for free"; there are endless possibilities for intricate designs. There is no need for assembling complex products since they can be printed as such, with movable internal parts. [174] 3D printing enables fast manufacturing since new products can be realised quickly with little or no lead time. There is also no need for special manufacturing skills since manufacturing takes place in principle by pressing a button, provided that certain requirements are fulfilled e.g. in relation to the CAD files.

Furthermore, 3D printing is sustainable; production is more efficient since the use of raw materials is limited only to the amount necessary and the printed goods are easily recyclable. For example, printed plastic or metal objects are easily recycled for re-use. Other benefits include planned obsolescence, the absence of the need for manufacturing in distant low-cost states resulting in high transportation costs, precise physical replication of existing objects,[175] compact and portable manufacturing,[176] shorter production chain and economies of scale; one item can be created at the same per-item cost as multiple items of the same or

[170] For example, the current consumer grade 3D printers employing FDM technology print at a speed between 25 to 300 millimetres per second. See Evans 2012, p. 17.
[171] See Subsection 3.2 above.
[172] For example the Formlabs Form 2 printer <https://formlabs.com/3d-printers/form-2/>, last visited on 4 April 2017.
[173] See e.g. Grieser 2015.
[174] Van der Berg 2016, p. 13.
[175] Note that in case an object is reverse-engineered, i.e. 3D scanned and reproduced without the original CAD file and print configuration, perfect copies are almost impossible to achieve with contemporary technology. See Subsection 4.2.4 below.
[176] *Lipson and Kurman* note that when the printing apparatus of the 3D printer is arranged so that it can move freely, a 3D printer can produce items considerably larger than the printer itself, whereas a traditional injection molding machine is only able to produce items considerably smaller than itself. See Lipson – Kurman 2013, p. 22.

similar design.[177] The period of time to get from design to end product is also significantly shorter with 3D printed products,[178] and the risk of a product completely failing in the market is low, since there is no need for producing huge quantities of identical units and the designs can be easily changed based on consumer feedback without changing the manufacturing process.[179]

From a holistic point of view on the economic benefits of 3D printing, barriers to entry into a design and small-scale production market are significantly reduced, when the commencement of manufacturing no longer requires massive upfront investments, storage space and extensive logistics of raw material and finished products.[180]

The downsides of 3D printing should also be considered, i.e. what 3D printers cannot do. Firstly, 3D production is time-consuming. One print can easily take hours to make and the quality and preciseness does not yet reach that of subtractive manufacturing processes.[181] Thus, the technology is restricted in the sense of detail and precision that can be reached, especially in relation to the more affordable printers.[182] Due to the material restrictions, the printed products may be lacking in strength or in flexibility.[183] There are also design barriers,[184] i.e. a certain level of skill is required in order to be able to design a functioning CAD file and print it with a certain material,[185] mainly because the technology is still in its early stage.[186] Proper industrial-scale printers can also be extremely expensive and the

[177] Lipson – Kurman 2013, pp. 20–24. See also Subsection 4.2.1 below.
[178] *ibid*, p. 30.
[179] Mendis 2013, p. 157.
[180] Lipson – Kurman 2013, p. 47.
[181] Ebrahim 2016a, p. 6. As already mentioned above, the higher the level of precision and detail, the longer the 3D printing of the object takes since single layers are thinner and the same object requires more layers to be printed.
[182] The rapid pace of development of the technology is bound to diminish the gap between the two methods of manufacturing. For example the recently unveiled method of "Continuous Liquid Interface Production" or "CLIP" is boasted to be 25 to 100 times faster than the currently available processes of 3D printing. See Krassenstein 2015.
[183] On the other hand, contemporary 3D printers are able to combine different materials in the printing process, whereas traditional manufacturing would require different materials to be assembled in a later stage of manufacturing. See Lipson – Kurman 2013, p. 23.
[184] Mendis 2014, p. 266. See also Mathias – Rao 2015, pp. 554–556. *Mathias and Rao* have suggested that a knowledge gap prevents large-scale consumer adoption of the technology at present, since 3D software is difficult to use as it is and it is a key competency required to print consumer-created 3D outputs. According to a survey carried out by *Mathias and Rao*, only 10 % of consumers had used 3D printers.
[185] Ballardini – Norrgård – Minssen 2015, p. 864.
[186] On the other hand, a plethora of software exists already today that assists in the creation of feasible CAD files. See e.g. Larson 2013, pp. 10–11.

operating costs of certain methods might be high.[187] Additionally, proper three-dimensional modelling software can be costly.[188]

The available variety of materials and colours is also restricted and tied to the method of printing, although the variety is expanding continuously as new materials are invented and introduced to the public. For example, SLA technology can only employ photosensitive resins with a limited variety of different characteristics and FDM processes require that the material can be melted and subsequently extruded through the printer's nozzle. At least within the more affordable sector of 3D printers, 3D printed products are usually of less details, single colour and made of a single material.

One interesting point about 3D printing is the possibility to manufacture "away from control", i.e. the ability to manufacture products at home or in a garage without third parties being able to control or prevent it.[189] Whether this characteristic is seen as a downside or a benefit depends on the perspective. IP proprietors who rely on controlling manufacturing in order to prevent infringing goods from entering the market may see this as a threat, but consumers, end-users, small entrepreneurs and innovators may see this as a huge benefit. The fact that private use falls outside the scope of trade mark protection means that the vast majority of cases where 3D printing takes place away from control is perfectly legal.[190]

All in all, the technology of 3D printing provides unlimited possibilities for creating or improving different designs for objects. There is a vast array of printable products and it is rapidly expanding amidst new technological inventions. Printing of clothes, spare parts, accessories, food etc. is already possible and the printing of complete organs and other complex biological objects is anticipated in the near future.[191] On the other hand, due to the inherent restrictions on the technology, it is mainly suitable for low-volume production.[192]

[187] Mendis 2013, p. 158 and Li – Kucukkoc – Zhang 2017, p. 158.
[188] Open-source and free-to-use browser based software such as Tinkercad enable already today consumers to make their own designs without having to purchase expensive software licenses. See Evans pp. 87–93 and <www.tinkercad.com>, last visited on 23 April 2017.
[189] Hornick 2015, p. 803.
[190] *Ibid*, p. 805.
[191] Recently, even a liveable 37 square meter house was printed and in just 24 hours' time. The Telegraph, 3 March 2017 <http://www.telegraph.co.uk/technology/2017/03/03/incredibly-cheap-house-3d-printed-just-24-hours/>, last visited on 9 March 2017.
[192] Mendis 2013, p. 158.

4. LIKELIHOOD OF CONFUSION AND 3D PRINTING

4.1. General

Bearing the justifications and dichotomies of trade mark protection mentioned in the introduction in mind, the protection of a proprietor's trade mark rights becomes necessary when competitors take up similar signs.[193] From an economic point of view, in case consumers might confuse the two signs with one another, unjustified harm is caused to the proprietor, especially in case this similarity is intended in order to free-ride on the reputation of the earlier trade mark.[194] In case trade mark rights were not protected against confusingly similar marks, there would be less incentives to develop a strong trade mark or brand and produce high-quality goods, since these investments could not be maintained and connected to the proprietor.[195] Although similar signs are not always used intentionally, the higher the number of consumers being misled and confused, the likelier it is that the costs of confusion exceed the costs of changing the junior mark.[196] Additionally, when rules on likelihood of confusion are clear, the costs and risks in relation to developing new trade marks or trade names are minimised.[197]

In order not to overly extend the protection afforded to the proprietor, however, a certain degree of proof of confusion is required. This is also justified in an economic sense. The *bona fide* development of a junior trade mark imposes costs and requires investments which should also be protected to some extent.[198] Additionally, as explained above, public interests require certain types of general words, figures, shapes and other signs to be kept in the public domain in order to avoid unjustified trade mark monopolies. In practice, there can be several similar trade marks co-existing on the market, residing outside the scope of the exclusive right that the proprietor simply must endure.[199]

From the perspective of European trade mark law, the assessment of likelihood of confusion itself is a calculus applied in situations of conflict between trade marks in proceedings

[193] For example, *Pakarinen* has stated that protection against likelihood of confusion is in principle afforded only in competitive relations. See Pakarinen 2006b, p. 49.
[194] Landes – Posner 2003, p. 203.
[195] *Ibid*, p. 204. One should note that brand creation does not necessarily depend on trade marks, but trade mark protection supports brand development. See supra 81 and Yelnik 2010, pp. 206–209.
[196] Landes – Posner 2003, p. 205.
[197] According to *Pakarinen*, a higher level of predictability would facilitate the entry into market of smaller actors, since the risks of trade mark conflicts with existing signs could be easily minimised. Pakarinen 2006a, pp. 87–88.
[198] Landes – Posner 2003, p. 201.
[199] Pakarinen 2006b, p. 49.

before the EUIPO, the GC and the ECJ as well as in infringement proceedings before the courts of the Member States. However, neither the TMD nor the TMR contain a definition of likelihood of confusion or a statement as to precisely what "confusion" refers to.[200] The concept of likelihood of confusion is a legal concept rather than a mere factual evaluation of the rational judgments and emotional preferences, guiding the cognitive behaviour and purchasing habits of the relevant public. The assessment of likelihood of confusion depends on both legal and factual assessment.[201] Thus, likelihood of confusion does not depend solely on behavioural or psychological rules of perception and cognition or mere interpretation of legal jargon, but it is a combination of both elements.

The doctrine of likelihood of confusion protects primarily the origin function of trade marks. When a junior trade mark is so similar to an earlier mark that confusion as to the economic origin of the marks arises, the use of the junior mark can be prohibited. On the other hand, an excessively broad interpretation of the concept of confusion would seriously hinder the internal market, and too broad a protection for trade marks on the basis of a risk of association with other marks would make it very difficult for many trade marks to be registered, especially at EU level in accordance with the TMR.[202] *Pihlajarinne* has suggested that the doctrine of likelihood of confusion can be seen as an underlying legal principle of trade mark law.[203] Due to the overall evaluation of all relevant circumstances, it is particularly adaptable to emerging situations of interpretation in connection with digitalisation.[204]

Likelihood of confusion arises in two main situations. Firstly, it may arise in connection with relative grounds for refusal or invalidity when applying for trade mark registration or declaring a registration invalid. Secondly, likelihood of confusion may arise in relation to the scope of the proprietor's exclusive right, i.e. trade mark infringement.[205] The evaluation of likelihood of confusion is similar in the said scenarios, since the notion of likelihood is the same e.g. in Articles 5(1)(b) and 10(2)(b) TMD,[206] regardless of the fact that in the first

[200] EUIPO Guidelines for Examination of EU Trade Marks 2017; Part C, Section 2, Chapter 1, p. 5. On the level of international treaties, likelihood of confusion is set out e.g. in Article 16 of the TRIPs Agreement.
[201] EUIPO Guidelines for Examination of EU Trade Marks 2017, Part C, Section 2, Chapter 1, p. 8.
[202] Opinion of Advocate General Jacobs in the case C-425/98, *Marca Mode CV v Adidas AG and Adidas Benelux BV*, 27 January 2000, ECLI:EU:C:2000:56, paras 33 and 35.
[203] Pihlajarinne 2012c, p. 389.
[204] *Ibid*.
[205] The provisions concerning the two situations are situated in Articles 5(1)(a)–(b) TMD and Articles 8(1)(a)–(b) TMR (first situation) and Articles 10(2)(a)–(b) TMD and Articles 9(2)(a)–(b) TMR (latter situation).
[206] Judgment of the ECJ in the case C-425/98, *Marca Mode CV v Adidas AG and Adidas Benelux BV*, 22 June 2000, ECLI:EU:C:2000:339, paras 25–28. The same applies to Articles 8(1)(b) and 9(2)(b) TMR. Haarmann

scenario the authority carrying out the evaluation is primarily the registrar and in the second scenario it is a court.[207] The essence of the inquiry is still always the same.[208] The two scenarios are also intertwined, since the registration of a trade mark can be challenged later, e.g. when a dispute over trade mark infringement arises.[209] The form of protection afforded under the relevant provisions has been further divided into three subcategories: protection against identical marks in same goods or services,[210] protection against identical or similar marks in same or similar goods or services and the extended protection of marks with a reputation.[211]

Table 1: different scenarios of likelihood of confusion

Type of protection	**Identical trade marks**	**Similar trade marks (the core of likelihood of confusion)**	**Extended protection of trade marks with a reputation**
Confusion	Assumed likelihood of confusion	Likelihood of confusion needs to be established	May include likelihood of confusion, not required
Relative grounds for refusal or invalidity	Art. 5(1)(a) TMD and Art. 8(1)(a) TMR	Art. 5(1)(b) TMD and Art. 8(1)(b) TMR	Art. 5(3)(a) TMD and Art. 8(5) TMR
Infringing trade mark use	Art. 10(2)(a) TMD and Art. 9(2)(a) TMR	Art. 10(2)(b) TMD and Art. 9(2)(b) TMR	Art. 10(2)(c) TMD and Art. 9(2)(c) TMR

has noted that likelihood of confusion is not an absolute ground for refusal or invalidity, but a similar situation where a mark is deemed misleading is an absolute ground for refusal or invalidity. See Haarmann 2014, pp. 358–359. Note that the concept of likelihood of confusion is identical in accordance with TMD and TMR, except for slight differences concerning e.g. territoriality of protection. See Morris 2012, p. 6.

[207] *Davis et al* have criticised the similarity of the provisions as being naïve, since the wording of the provisions relates primarily to trade mark infringement, and the two different forms of likelihood of confusion appear in significantly different situations, what the provisions fail to reflect. See Davis et al 2014, pp. 521–522.

[208] There is the slight difference, that in connection with a registration application, the applied mark is compared with the earlier mark as it is registered, whereas in connection with infringement proceedings the comparison is made between the used sign and the registered mark. Cornish – Llewelyn – Aplin 2013, p. 743. See also judgment of the ECJ in the case C-482/09, *Budějovický Budvar, národní podnik v Anheuser-Busch Inc.*, 22 September 2011, ECLI:EU:C:2011:605, paras 70–74, where the court found that the same principles are applied in connection with Articles 5(1) and 10(2) TMD.

[209] For example see judgement of the ECJ in *Budějovický Budvar*, where the court held that double identity in accordance with the current Article 10(2)(a) TMD resulted in the registration being able to be declared invalid in accordance with the current Article 5(1)(a) TMD. *Davis et al* also point out that it is not possible for an earlier mark to infringe a later registered mark without it invalidating the later mark. Davis et al 2014, p. 577.

[210] In these situations, likelihood of confusion is presumed. The rule is based on Article 16(1) of the TRIPs Agreement. This form of protection can come into question for example when a product protected by a three-dimensional trade mark is 3D scanned and reproduced.

[211] Here the likelihood of confusion is usual, but not required for affording protection, which focuses on protecting the goodwill of the trade marks against free-riding, blurring or tarnishment.

In this section, the questions related to the aforesaid scenarios will be assessed from the point of view of 3D printing and three-dimensional trade marks. The assessment will commence from the general aspects of likelihood of confusion in relation to 3D printed objects, i.e. the level of similarity of the marks in question and the relevant goods or services. After this, the special requirements for trade mark infringing use will be evaluated. Lastly, the likelihood of confusion in relation to CAD files will be looked into.

4.1.1. Systematisation of Different Situations of Likelihood of Confusion

The TMD or TMR do not elaborate on the different types of situations where confusion can take place. However, the array of different situations where likelihood of confusion may arise is diverse and somewhat vague, rendering some level of systematisation necessary in order to determine the situations where likelihood of confusion is apparent. A proper framework becomes even more significant in relation to new forms of possible situations of likelihood of confusion arising from emerging technologies.

Different systematising attempts have been formulated in various legal traditions around the EU.[212] Finnish legal literature has traditionally approached the matter in a slightly different manner than other European legal regimes by focusing on a doctrine of *perception of identity* (*identiteettielämys*),[213] which focuses on the level of similarity between the marks and the level of distinctive character of the senior mark, instead of focusing on how the consumers perceive the economic source of the goods.[214] Additionally, Finnish legal scholars have traditionally approached the origin function quite sceptically.[215] Therefore, older Finnish legal literature has been at odds with CJEU case law, which has emphasised the origin function as the essential function. In connection with the EU, Finnish trade mark

[212] For example in Sweden, a government proposal for a trade mark act in 1958 drew a distinction between four different situations where likelihood of confusion may arise: (i) when the marks are identical; (ii) the marks are similar and represent each other so extensively that they can be understood as same marks; (iii) the similarity of different marks causes other forms of confusion, e.g. likelihood of association; and (iv) the later mark mimics the dominant part of another trade mark. See Swedish Government Bill SOU 1958:10, p 252.
[213] See e.g. Palm 2002, pp. 130–131.
[214] *Ibid*, p. 135. Finnish trade mark law has not traditionally drawn a doctrinal difference between situations where marks are identical and where the marks are not identical but similar, but treated both situations similarly.
[215] For example *Tiili* has argued that the traditional view of the doctrine of likelihood of confusion is flawed and the protection of trade marks should emphasise the marketing function of trade marks, since consumers do not see trade marks in the same manner as courts and registrars do. Instead of assessing the likelihood of confusion, one should focus on the perception of identity since the main purpose of trade mark law is not the protection of consumers. Tiili 1972, pp. 255–256 and 262. *Tiili*'s argument is based especially on situations where competing goods or services are similar and there are no significant differences in quality. At least in such cases, according to *Tiili*, the anonymous economic origin is of no interest to consumers. See also Palm 2002, p. 133 and Drockila 1986, pp. 186–187.

law has, however, been adapted to conform with EU law.[216] More recent Finnish legal literature has come significantly closer to the interpretation adopted in the EU.[217]

In the UK and US, likelihood of confusion has been divided into different subcategories, e.g. pre-sale confusion, or initial interest confusion, point of sale confusion and post-sale confusion.[218] The US approach focuses on the practical role of the trade mark in the marketplace.[219] US scholars have also suggested the existence of a "reverse confusion", where the consumers are caused to believe that the trade mark proprietor's goods are in some manner connected with the infringer. This doctrine concerned with the different direction of confusion is not separated from "traditional confusion" in European regimes.[220] Some parts of the Anglo-American approach have recently found footing in European trade mark law, e.g. the doctrines of initial interest confusion and post-sale confusion.[221]

It is noteworthy that a mere association between the two marks does not constitute likelihood of confusion.[222] A similar categorisation has been adopted in German legal literature.[223] German scholars have also suggested a doctrine for the *protection of motives* (*Motivschutz*), which means the protection of the spiritual character or idea behind the trade mark found by penetrating through the apparent character of the mark into the "general concept" underlying the trade mark.[224] In *Sabel*, however, the ECJ seemed slightly hostile towards the doctrine.[225] In addition to the situations described above, the Benelux Court of

---

[216] This is due to the need for extensive harmonisation in EU trade mark law explained above in Section 2.2.
[217] More recent Finnish legal literature has drawn a distinction between three different situations of likelihood of confusion: (i) direct confusion, where the marks are identical or almost identical; (ii) likelihood of indirect confusion or association, where the public is likely to be confused regarding the economic origin of the goods or services; and (iii) likelihood of confusion in the broad sense, where the public acknowledge that the producers are separate but may be confused about a possible economic connection between the marks. See Castren 2000, pp. 323–324 and Pihlajarinne 2009, pp. 105–109.
[218] Palm 2002, pp. 204–205.
[219] Phillips 2003, p. 350.
[220] *Ibid*, p. 351.
[221] For example, the UK High Court of Justice (Chancery Division) found in its judgment in the case *Och-Ziff Management Europe Ltd v Och Capital LLP* [2011] F.S.R. 11, 20 October 2010, that that initial interest confusion is actionable under Article 9(1)(b) TMR. For a more detailed analysis on the doctrine and its adoption in the EU, see e.g. Pihlajarinne 2009, pp. 188–189 and Blythe 2016. Concerning the US based doctrine itself see e.g. Maynard 2000, pp. 1313–1351. However, the existence of post-sale confusion in European trade mark law has been questioned by e.g. *Davis et al*. See *Ruiz-Picasso*, paras 44–48 and Davis et al 2014, p. 538. See Section 4.1.3 below.
[222] Castren 2000, p. 324.
[223] Drockila 1986, pp. 109–110. According to *Drockila*, German legal literature has recognised likelihood of confusion in the narrow and broad sense, the former encompassing direct and indirect likelihood of confusion.
[224] Palm 2002, p. 151. The protection of the underlying concept has been accepted to some extent in the assessment of the similarity of the marks discussed below in Subsection 4.2.3.
[225] Reich 2005, p. 179, and *Sabel*, para 25: "*the mere fact that the two marks are conceptually similar is not sufficient to give rise to a likelihood of confusion*". It should be noted that the ECJ made this remark in connection with marks which are not especially well known to the public. In relation to marks with a reputation, the protection of motives might have significance at least to some extent.

Belgium, Luxembourg and the Netherlands has identified likelihood of association in the strict sense, which comprehends situations where a sign is likely to give rise to association with an earlier trade mark, leading to the public making a connection between the sign and the mark.[226] In practice, this means a quite broad concept of confusion.[227]

In its recent case law, the CJEU has implied a recognition of a new situation where likelihood of confusion may arise.[228] In *Interflora*, the ECJ held that the function of the trade mark of indicating origin is adversely affected in cases where reasonably well-informed and reasonably observant internet users assume incorrectly that the user of a junior sign would be a part of the commercial network of the proprietor of the senior mark.[229] The *Interflora* judgment formulated also a new test for finding likelihood of confusion. According to *Interflora*, the court should first assess, whether reasonably well-informed and reasonably observant internet user is deemed to be aware, on the basis of general knowledge of the market, that the user of the junior mark is not part of the commercial network of the proprietor of the earlier mark but is, on the contrary, in competition with it. If not, the court should proceed to assess whether the use of the junior mark enabled that internet user to tell that the service concerned does not belong to the commercial network of the proprietor of the earlier mark.[230]

All in all, four main situations can be identified where likelihood of confusion is prone to arise:[231]

(i) the traditional view of direct confusion that likelihood of confusion arises when the target group is likely to confuse a mark with another, i.e. a perception of identity rises;

(ii) likelihood of indirect confusion or association may be at hand where confusion concerning the economic source of the goods or services arises;

[226] *Sabel*, para 15.
[227] Gielen 1998, p. 109.
[228] Simon Fhima 2014, p. 156.
[229] Judgment of the ECJ in the case C-323/09, *Interflora Inc. and Interflora British Unit v Marks & Spencer plc and Flowers Direct Online Ltd*, 22 September 2011, ECLI:EU:C:2011:604, para 49.
[230] *Ibid*, para 51. *Simon Fhima* has criticised this test since in the first phase the junior user of the mark is required to prove a negative, and in case it cannot do it, the burden of proof is shifted on the junior user. See Simon Fhima 2014, pp. 156–157.
[231] These situations relate mainly to Articles 5(1)(b) and 10(2)(b) TMD or Articles 8(1)(b) or 9(2)(b) TMR, but can be applied similarly to other forms of protection as well when likelihood of confusion is assessed. This systematisation is based on *Sabel*, para 16. It is the prevailing doctrine in contemporary EU trade mark law, which all Member States must adhere to.

(iii) likelihood of association in the strict sense, which arises where the public considers the sign to be similar to the mark and perception of the sign calls to mind the memory of the mark, although the two are not confused; and

(iv) likelihood of confusion where reasonably well-informed and reasonably observant internet users assume incorrectly that the user of a junior sign would be a part of the commercial network of the proprietor of the senior mark.[232]

4.1.2. Likelihood of Association

According to the wording of TMD and TMR, the likelihood of confusion encompasses the likelihood of association with the earlier trade mark.[233] This notion of likelihood of association was adopted partially from the Benelux Court's legal tradition, but in an ambiguous manner.[234] In *Sabel*, the ECJ found, however, that the mere existence of likelihood of association is not sufficient for finding likelihood of confusion in accordance with Article 5(1)(b) TMD.[235] The court held that the concept of likelihood of association is not an alternative to that of likelihood of confusion, but serves to define its scope, and that it *per se* does not establish the likelihood of confusion on the part of the public. Still, the ECJ admitted that conceptual similarity can in some cases lead to likelihood of confusion as such in case the earlier mark possesses a particularly distinctive character.[236] In relation to highly distinguishable trade marks, the ECJ later stated in *Adidas* that regardless of the fact that a trade mark is highly distinguishable especially due to it having a reputation, the reputation as such does not result in the existence of likelihood of confusion merely based on likelihood of association.[237]

Moreover, in the later *Canon* case, the ECJ found that where the risk that the public might believe that the goods or services came from the same undertaking or from *economically-linked* undertakings, likelihood of confusion was seen to arise.[238] This interpretation can be seen as providing some significance for the doctrine of likelihood of association. All in all,

---

[232] *Interflora*, para 49.
[233] Article 5(1)(b) TMD and Article 8(1)(b) TMR. The concept of likelihood of association was added to the wording of the TMD and TMR due to pressure from the Benelux countries. See e.g. Turner-Kerr 2001, p. 50.
[234] The wording of said articles does not, however, elaborate on the relation between the Benelux Court's doctrine of likelihood of association and likelihood of association included in the doctrine of likelihood of confusion, but the matter was left to the courts. The provisions merely state that "the likelihood of confusion includes the likelihood of association". See e.g. Palm 2002, pp. 145–146.
[235] *Sabel*, para 26.
[236] This ultimately meant that a distinction was struck between the EU doctrine of likelihood of confusion and the legal tradition of the Benelux court. See *Sabel*, paras 18 and 24 and Palm 2002, p. 150.
[237] *Adidas*, paras 41–42.
[238] *Canon*, para. 29.

the doctrine is a sub-set of the concept of likelihood of confusion. It does not have independent significance since it cannot establish likelihood of confusion alone, but it is still a part of the global assessment of all relevant circumstances.

4.1.3. When Can Confusion Take Place?

The exact time when confusion occurs in relation to the sale has not been considered determinant in the assessment, which is based on global appreciation of all relevant factors.[239] In legal literature, three subcategories of likelihood of confusion have been identified depending on the time when confusion takes place: initial interest confusion, point of sale confusion and post-sale confusion.[240]

Post-sale confusion has a vague position in European trade mark law. According to the doctrine, confusion takes place on the part of the relevant public as to the trade origin of goods or services *after* the goods and services have been purchased.[241] Some scholars have suggested that the ECJ has dismissed post-sale confusion as irrelevant and the doctrine has been questioned by legal scholars and advocate generals,[242] whereas several scholars have argued that post-sale confusion has been accepted by the ECJ and is an established part of European trade mark law.[243] The latter view has also been suggested by courts in the UK.[244] For example *Morris* has claimed that the post-sale doctrine has been adopted in the EU, where courts never explicitly mention the doctrine, but cryptically describe situations similar to it.[245] Therefore, the significance of post-sale confusion cannot be dismissed and the doctrine is considered in this research.[246]

---

[239] Morris 2012, p. 26.
[240] *Ibid*, pp. 3 and 7.
[241] See judgment of the UK Chancery Division (Patents Court) by Justice Arnold in the case *Datacard Corp v Eagle Technologies Ltd* [2011] R.P.C. 17, 14 February 2011.
[242] See *supra* 196. See also opinion of Advocate General Kokott in the case C-412/05 P, *Alcon Inc. v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 26 October 2006, ECLI:EU:C:2006:687, para 51 and opinion of Advocate General Colomer in the case C-361/04 P, *Claude Ruiz-Picasso and Others v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 8 September 2005, ECLI:EU:C:2005:531, para 54.
[243] Breitschaft 2010, pp. 429–430, Clay 2011, p. 104, Morris 2012 and Blythe 2015b, p. 714 and judgments of the ECJ in *Arsenal*, para 57, C-245/02, *Anheuser-Busch Inc. v Budějovický Budvar, národní podnik*, 16 November 2004, ECLI:EU:C:2004:717, para 60 and *Ruiz-Picasso*, para 41.
[244] See judgment of the UK Chancery Division (Patents Court) by Justice Arnold in the case *Datacard Corp v Eagle Technologies Ltd* [2011] R.P.C. 17, 14 February 2011.
[245] Morris 2012, p. 46.
[246] Pre-sale and post-sale confusion might possess more relevance in connection with marks with a reputation by providing protection against blurring or tarnishment. See Blythe 2016 in relation to European trade mark regime and Ehrlich 1991 in relation to the US.

As mentioned above, the US based doctrine of initial interest confusion, or pre-sale confusion, is also finding increasing foothold in European trade mark law, especially in the internet context.[247] Therefore, likelihood of confusion might be possible even in cases where confusion takes place well before the time the consumer makes the purchase, regardless of whether the confusion has been dispelled prior to it.[248] Since post-sale confusion has been accepted to some extent in CJEU case law, initial interest confusion should be no different.[249]

Initial interest confusion and post-sale confusion become relevant mainly in the digital context, therefore they will be assessed primarily in connection with CAD files. Albeit said subcategories of confusion may also emerge in connection with physical 3D printed items, it should be noted that at least in a world of physical products, post-sale confusion claims have never been successful so far.[250]

4.2. Evaluating Likelihood of Confusion in 3D Printing

Likelihood of confusion arises when two marks are so similar that the marks might be confused with one another from the perspective of the relevant public, i.e. a collision between the marks arises. Protection of three-dimensional trade marks against likelihood of confusion requires that the marks concerned are identical or similar and the respective goods are same or similar. Unlike in cases of identical marks in same goods or services, in case of mere similarity the existence of likelihood of confusion needs to be evaluated.[251] After establishing those circumstances, one needs to assess whether the marks concerned are identical or sufficiently similar to constitute likelihood of confusion. This requires the assessment of how the concepts of identical[252] or similar[253] are interpreted in connection with 3D printing. One should also keep in mind the following principles: the more

[247] See *supra* 221. Even though the doctrine has been carefully adopted by European courts, it has not been explicitly mentioned in European case law yet. Especially courts in the UK, France and Germany have been applying the doctrine in the internet context. See Gillieron 2008, pp. 693 and 700–704 and Simon Fhima 2013, pp. 312-318.
[248] Davis et al 2014, p. 538 and Blythe 2016, pp. 204–205.
[249] *Simon Fhima* has suggested that European trade mark law should not continue on the road towards finding "pre-sale", "post-sale" or "point of sale" confusion, but embrace a single concept of "operative confusion" instead, focusing on the effect on how consumers behave. This approach would enable legal remedies in all cases where confusion leads to damage. Simon Fhima 2013, pp. 315–318. The suggestion would make sense in relation to global appreciation of all relevant factors
[250] Post-sale confusion claims have never been successful within European Trade Mark law so far. See Morris 2012, p. 31.
[251] See Subsection 4.1 above and Subsection 4.2.4 below.
[252] For example Article 10(2)(a) TMD and Article 9(2)(a) TMR.
[253] For example Article 10(2)(b) TMD and Article 9(2)(b) TMR.

distinctive the character of the earlier mark, the less similarity is required of the goods or services and the more general or weak the earlier mark is, the higher the level of similarity is required of the goods or services in question.

The evaluation of confusion is largely based on subjective assessment and thus not in any way an exact science, but certain principles have been developed in CJEU case law and legal literature in order to guide the evaluation process and enhance legal certainty.[254] European case law and the similarity of legislative provisions regarding the likelihood of confusion have enabled a similar interpretation of the key concepts such as similarity and likelihood of confusion in European legal praxis across different Member States.[255]

Based on CJEU case law and guidelines of the EUIPO, the evaluation of likelihood of confusion is carried out in steps, as it requires consideration of the following aspects:

(i) similarity of the goods or services;
(ii) the relevant public and respective level of attention of each relevant focus group;
(iii) similarity of the marks concerned;
(iv) distinctiveness of the earlier mark;
(v) other relevant factors, such as the marketing circumstances of the goods or services; and
(vi) global appreciation of i.a. the level of similarity in a visual, aural or conceptual sense.[256]

Thus, all relevant circumstances are considered when a global assessment of likelihood of confusion is carried out.[257] The assessment here will be divided into two main levels, mainly the assessment of 3D printed physical objects and digital design files, i.e. CAD files. In relation to 3D printed objects, one scenario that will be discussed concerns a product

[254] Salmi et al 2008, pp. 275–276.
[255] *Ibid*, p. 285. This is especially apparent when comparing the trade mark traditions of Member States from before joining the EU and after, for example in relation to Finland. See Subsection 4.1.1 above.
[256] Palm 2002, p. 173 and EUIPO Guidelines for Examination of EU Trade Marks 2017, Part C, Section 2, Chapter 1, p. 10.
[257] *Palm* has supported the global appreciation of all relevant circumstances due to its flexibility and economic rationality, whereas *Pakarinen* has criticised this model for lack of legal certainty, promoting a model of more restricted criteria for assessment that would facilitate predictability and cost efficiency. Likewise, *Davis et al* have argued that it is wrong to consider every fact and matter related to the case, preferring the approach of UK courts which consider only the actual context and circumstances of the use of the sign. See Palm 2002, p. 304, Pakarinen 2006a, p. 85 and Davis et al 2014, pp. 586–587. Considering the rapid pace of change in technology and the economy, and the need for technology neutrality of trade mark law, the model of global appreciation would seem a more appropriate approach since it can easily adapt to different contexts and changing environment. The matter is related to the bigger discussion concerning the scope of protection afforded by trade marks; whether only the sign is protected *per se*, or the brand surrounding the sign.

protected by three-dimensional trade mark being 3D scanned and reproduced without changing the design. The second scenario under scrutiny concerns a situation where a protected product is 3D scanned or an existing CAD file representing the product is acquired from an online repository and the design is subsequently amended to an extent or a new products is designed from scratch using the protected product as a model, resulting in a different but similar product.[258]

4.2.1. Identical or Similar Goods or Services

As a prerequisite for the existence of likelihood of confusion, the goods or services that the trade marks are used in connection with need to be identical or sufficiently similar in order to enable confusion in the average consumer about the economic source of the goods.[259] *Davis et al* have characterised the prerequisite as a threshold requirement for finding likelihood of confusion, which must be determined purely by reference to the goods or services.[260] Even the slightest similarity between the goods or services suffices in certain situations.[261] According to the CJEU, the two aspects of the overall assessment of likelihood of confusion, i.e. the similarity of the marks concerned and the similarity of goods or services are interconnected. A lower degree of similarity between the goods or services may be offset by a higher degree of similarity between the marks, and vice versa.[262] This principle has been derived from recital 16 of the preamble of the TMD.[263] The principle was not developed by EU legislators, however, but it originates from the legal traditions of the Member States, where it has been widely accepted. The principle has i.a. been recognised in earlier Nordic literature.[264]

It should be borne in mind, however, that a clear distinction between the goods or services can never be offset by identical trade marks.[265] This interpretation is apparent from the

[258] See Mendis 2014, p. 270.
[259] Drockila 1986, p. 136.
[260] Davis et al 2014, p. 528.
[261] Salmi et al 2008, p. 345.
[262] Judgments of the ECJ in *Canon*, para 17 and C-342/97, *Lloyd Schuhfabrik Meyer & Co. GmbH v Klijsen Handel BV*, 22 June 1999, ECLI:EU:C:1999:323, para 19.
[263] Ibid. Note that the cases mentioned refer to the tenth recital of the preamble of the preceding Trade Mark Directive 89/104/EEC, the content of which is similar to the current 16 recital. The EUIPO refers to this principle as the *interdependence principle*. See EUIPO Guidelines for Examination of EU Trade Marks 2017, Part C, Section 2, Chapter 7, pp. 3–4.
[264] See e.g. Drockila 1986, p. 99. In Finnish literature this principle has been referred to as the "product rule" (*tulosääntö*).
[265] Judgment of the ECJ in the case C-398/07 P, *Waterford Wedgwood plc v Assembled Investments (Proprietary) Ltd and Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 7 May 2009, ECLI:EU:C:2009:288, para 34.

wording of Articles 5(1)(b) and 10(2)(b) of the TMD or 8(1)(b) and 9(2)(b) of the TMR, and was confirmed by the ECJ in *Canon*[266]. On the contrary, sufficiently distinctive marks can subsist parallel to one another, disregarding that they are borne by identical goods or services. When the overall visual impression conveyed by the earlier mark is different from that conveyed by the later mark, the dissimilarities between the conflicting signs can be sufficient for it to be held that they are not similar visually, regardless of the reputation of the earlier mark.[267] According to CJEU case law, the certain minimum level of similarity is more than "complete lack of similarity".[268]

The specification of goods or services for which registration is obtained may be critical in determining whether the relevant goods or services are identical or merely similar.[269] A classification system in accordance with the Nice or Vienna Agreements is usually used as a framework in determining the classes of goods or services.[270] Classification under the Nice framework does not determine the similarity or dissimilarity of the goods, but provides a medium for the assessment. *Ad hoc* overall assessment of all relevant factors is always primary.[271]

Similarly to the process of evaluating the level of similarity of the marks, all relevant factors need to be taken into account when assessing whether the goods or services are similar.[272] At least the following factors should be considered: the physical nature of the goods or services, the respective uses of the goods or services and their intended purpose, the method of use of the goods or services, whether the goods or services are complementary or not, the extent to which the respective goods or services are competitive or interchangeable, the respective distribution channels through which the goods or services reach the market, the points of sale i.e. whether the goods are found together or separate in self-service stores, the

[266] *Canon*, para 22.
[267] Judgment of the GC in the case T-110/01, *Vedial SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 12 December 2002, ECLI:EU:T:2002:318, paras 54 and 65, confirmed by the ECJ in its judgment in the case C-106/03 P, *Vedial SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 12 October 2004, ECLI:EU:C:2004:611.
[268] *Waterford Wedgwood*, para 34. See also Pihlajarinne 2010, p. 35.
[269] Phillips 2003, p. 334. See also judgment of the GC in the case T-224/01, *Durferrit GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 9 April 2003, ECLI:EU:T:2003:107, paras 40–41.
[270] See Section 2.2 above.
[271] This view has been acknowledged e.g. in the Memorandum of the Finnish Ministry of Economic Affairs and Employment 2012, p. 28. The use of Nice classification in connection with the TMD was accepted by the ECJ e.g. in the case C-307/10, *Chartered Institute of Patent Attorneys v Registrar of Trade Marks*, 19 June 2012, ECLI:EU:C:2012:361, para 56.
[272] *Canon*, para 23.

relevant public and the usual origin of the goods or services, if any.[273] In order to facilitate the assessment of similarity, the GC has suggested that identity of the relevant marks should be assumed while assessing the similarity of the goods.[274]

The nature of relevant goods needs to be determined from a *commercial* perspective.[275] This means that regardless of the materials used, the method of manufacturing or other technical factors, the similarity of goods is evaluated mainly from a commercial point of view.[276] Likelihood of confusion may arise even when there is no likelihood of the public being confused as to the place of production of the goods or services.[277] Due to the commercial perspective in the assessment, the fact that a product was created by 3D printing instead of using traditional manufacturing methods is irrelevant *per se* when it comes to evaluating likelihood of confusion. It can be taken into account, however, due to the overall assessment of all relevant circumstances,[278] but only to an extent that it affects the products concerned.

The inherent nature of the goods affects also the level of care that consumers take when inspecting the goods.[279] For example the GC has held that beer is a commodity that is not likely to be carefully studied by consumers prior to purchase due to its inherent nature.[280] As another example, even though not appearing to be similar at first sight, ice cream can be found similar to flour confectionery, rolls and biscuits, since they are all sweet foodstuffs which are very often served as desserts to be consumed after the main course of a meal.[281] Therefore, the most important criterion in the overall assessment is often the *intended*

[273] EUIPO Guidelines for Examination of EU Trade Marks 2017, Part C, Section 2, Chapter 1, p. 8. The list is derived from *Canon*. Additionally, the scope of protection has been extended in relation to highly distinctive marks in a sense that the distinctive character of the earlier mark and especially its reputation need to be taken into account also when evaluating the sufficiency of the similarity between the goods or services in order to give rise to the likelihood of confusion. See *Canon*, paras 18–19 and 24.
[274] Judgment of the GC in the case T-110/01, *Vedial SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 12 December 2002, ECLI:EU:T:2002:318, confirmed by the ECJ in its judgment in the case C-106/03 P, *Vedial SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 12 October 2004, ECLI:EU:C:2004:611. *Davis et al* have not accepted this assumption and have suggested that an assumption of unbranded goods should be used instead. See Davis et al 2014, pp. 528–530.
[275] Judgment of the ECJ in the case C-252/07, *Intel Corporation Inc. v CPM United Kingdom Ltd*, 27 November 2008, ECLI:EU:C:2008:655, para 50.
[276] Salmi et al 2008, p. 351.
[277] *Canon*, paras 29–30.
[278] *Ibid*, para 23.
[279] On CJEU case law on the matter see e.g. Phillips 2003, p. 345.
[280] Judgment of the GC in the case T-99/01, *Mystery drinks GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 15 January 2003, ECLI:EU:T:2003:7, para 41.
[281] Judgment of the OHIM BoA in the case R 795/1999-1, *Durigon GmbH v Rank Hovis Limited*, 21 March 2001 (Allegro/ALLEGRO), para 19.

purpose of the goods, since similar use leads to competing goods due to interchangeability and the same pool of potential consumers.[282]

From the point of view of 3D printing, the physical nature of the goods is largely affected by the material used in the print. In case the products differ in strength, flexibility or particularity so that the relevant goods are dissimilar, likelihood of confusion cannot arise. Secondly, when assessing the respective uses of the goods the physical nature bears significance. In case the characteristics of the goods differ to such an extent that renders them incapable of being used for a similar purpose, the goods cannot be deemed same or similar. As an example, a Lego figurine 3D printed by using sandstone might share the same appearance as the original figurine, but would be too brittle for being used as a toy. Hence, the goods cannot be deemed identical.[283]

The similarity of distribution channels is also an important factor in assessing similarity of the goods,[284] especially when the goods are sold with the other goods at similar points of sale in both major retail establishments and more specialised shops.[285] However, in case the goods are so distinct that they are not usually sold in connection with one another and customers are not likely to believe that the goods share the same commercial origin, the goods are not usually seen as similar regardless of whether they are sold through the same distribution channel.[286] Similarity can also depend on the level of assessment. At a micro-level, likelihood of confusion is unlikely to arise in connection with products sold in proximity to one another: e.g. knives and spoons are unlikely to be confused. On a more

[282] Salmi et al 2008, pp. 352–353. See e.g. judgment of the GC in cases T-169/03, *Sergio Rossi SpA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 1 March 2005, ECLI:EU:T:2005:72, para 57, confirmed by the ECJ in the judgment in the case C-214/05 P, *Sergio Rossi SpA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 18 July 2006, ECLI:EU:C:2006:494, and T-203/02, *The Sunrider Corp. v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 8 July 2004, ECLI:EU:T:2004:225, paras 64–67, confirmed by the ECJ in its judgment in the case C-416/04 P, *The Sunrider Corp. v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 11 May 2006, ECLI:EU:C:2006:310.

[283] In this example the classification of the goods bears significance. In case the relevant goods are not toys but ornaments, the fact that the 3D printed product is brittle does not exclude similarity since brittleness does not affect the intended use of the product.

[284] Salmi et al 2008, p. 359.

[285] Judgment of the GC in the case T-443/05, *El Corte Inglés, SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 11 July 2007, ECLI:EU:T:2007:219, para 45.

[286] Judgment of the GC in the case T-8/03, *El Corte Inglés, SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 13 December 2004, ECLI:EU:T:2004:358, para 43, confirmed by the ECJ in its order in the case C-104/05 P, *El Corte Inglés, SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 28 September 2006, ECLI:EU:C:2006:611.

general level, the objects become metaphysically more united by a string of shopping concepts such as cutlery in the said example.[287]

Trade channels might pose unique problems in relation to 3D printed goods. As mentioned above, 3D printing can enable large-scale decentralised cloud manufacturing of goods as well as domestic on-demand manufacturing for consumers.[288] This means that in comparison between conventional goods and 3D printed ones, the goods are less likely to be deemed identical or similar when 3D printed goods or the CAD files necessary for creating the object are purchased from certain online repositories or printing services, whereas the conventional items are purchased from more ordinary stores. In case a consumer acquires a CAD file for free or purchases or an object possessing a certain shape protected by three-dimensional trade mark from an online printing service (such as Shapeways),[289] the consumer is not likely to be confused about the economic origin of the product.[290] On the other hand, possible likelihood of confusion might theoretically arise if consumers incorrectly assume that an economic link, as found e.g. in *Canon*,[291] exists between the 3D printing service and the proprietor of the trade mark, based on vagueness resulting in uncertainty of the economic origin of the design.[292] Additionally, consumers might be confused to think that the online repository or printing service is a part of the commercial network of the proprietor as was the case in *Interflora*.[293] The aforementioned situation does not take place in situations where the physical goods or CAD files are sold in connection with one another. If, for example both the original trade mark protected goods and 3D printed goods are sold at a self-service store, it might be difficult for the consumer to separate between the goods based on a superficial and brief inspection.[294] A notably different packaging of the goods sharing the same shape might also fend off likelihood of

[287] Phillips 2003, pp. 336–337.
[288] For example, printing intermediaries, i.e. 3D printing services, are providing customers with either creation or customisation or both on their platforms and thus reducing the complexity and cost of delivery, transportation, logistics, and supply chain of 3D printed goods. Ebrahim 2016a, pp. 11–12.
[289] Shapeways is a 3D printing service and marketplace that sells 3D printed goods and provides printing services for user-uploaded design files. See <https://www.shapeways.com/>, last visited on 6 April 2017.
[290] From a US perspective, see Osborn 2014, p. 583.
[291] *Canon*, para. 29.
[292] See judgment of the ECJ in *Interflora*. Note that the mere likelihood of association is not sufficient to result in likelihood of confusion. See *Sabel*, para 18.
[293] *Interflora*, para 49. This could occur in relation to online repositories or printing services that are less known to the relevant public and might have confusingly similar names than the proprietor of the three-dimensional trade mark. Therefore, global appreciation of all relevant circumstances is determinant in finding likelihood of confusion in such situations.
[294] See *infra* 320.

confusion, especially in case the packaging is clearly stating the different economic origin of the goods.

The question whether the goods are offered to the same relevant public ot not bears also great significance. For example, cashmere sweaters and golf clubs were seen as not dissimilar when sold at golf tournaments.[295] In other circumstances they would most likely be seen as dissimilar. This is a good example of the significance of the global assessment, where all relevant factors are taken into account. All in all, the comparison of goods or services is always based on overall assessment, which focuses on whether the goods or services belong under a certain type so that the average consumer presumes that the goods or services originate from the same economic source if the borne trade marks are similar.[296] Owing to this, when apparently dissimilar goods are both offered to tech-savvy 3D printer hobbyists, the level of similarity is more likely to exceed the "complete lack of similarity".[297]

Competing goods are usually seen as similar.[298] Notable differences in price can, in principle, prevent similarity,[299] but there are also exceptions to this rule. For example *Salmi et al* have suggested that expensive luxury jewellery can, in some cases, compete with cheaper fashion jewellery despite the significant price gap.[300] In determining whether the goods are competitive, one must determine whether the goods are substitutable to one another or not.[301] Competing goods usually have the same existing or potential clientele.[302] Thus, also in 3D printing, it is necessary to assess whether the goods are competitive and interchangeable or adaptations of protected shapes in other types of goods that have distinct markets. Should the matter first be assessed from a practical point of view, the situations where 3D printed products can pose problems can be limited to certain types of products.

[295] Judgment of the German Bundesgerichthof in the case I ZR 235/00, GRUR 2003, 428 "Big Bertha", 10 October 2002.
[296] Davis et al 2014, pp. 529–530.
[297] *Waterford Wedgwood*, para 34. See also Subsection 4.2.2 below.
[298] Salmi et al 2008, p. 357.
[299] See e.g. Judgment of the GC in the case T-29/04, *Castellblanch, SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 8 December 2005, ECLI:EU:T:2005:438, para 53. The judgment was confirmed by the ECJ in its judgment in the case C-131/06 P, *Castellblanch SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 24 April 2007, ECLI:EU:C:2007:246.
[300] Salmi et al 2008, p. 358. This also implies the fact that creating so-called rules of thumb in relation to likelihood of confusion is difficult since the plethora of situations where confusion may arise cannot be fit into a single mold with ease.
[301] See e.g. judgment of the GC in the case T-175/06, *The Coca-Cola Company v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 18 June 2008, ECLI:EU:T:2008:212, para 68. In the case the GC noted that a certain measure of mutual substitutability ought to be acknowledged between wine and beer, but eventually found that the goods were not similar due to e.g. significant differences in alcoholic content.
[302] Salmi et al 2008, p. 358.

In some cases, 3D printing is not a viable alternative for traditional mass manufacturing of goods, which means that in practice 3D printing is unlikely to pose legal problems either.

As explained above, additive manufacturing, i.e. 3D printing, is a fundamentally different method of manufacturing compared to the traditional manner of mass manufacturing. Especially the cost structure of 3D printing differs significantly from traditional mass manufacturing. Mass manufacturing enables the relatively low cost per item ratio when producing huge quantities of identical goods, but includes high "hidden" costs, concentrated heavily in the beginning of the manufacturing process, such as the creation of molds, the calibration of production machinery, the design of the manufacturing process, the creation of prototypes etc. On top of this, the process includes electricity and material expenses as well as costs related to assembly and finishing of the final product. Another hidden cost is the machinery itself, which is usually limited in adaptability. A special machine used for a certain process usually cannot be adapted to another part of the manufacturing process or to the manufacturing of different types of products. Therefore, mass manufacturing usually requires multiple different types of machines. Due to the aforesaid, the cost per unit in mass manufacturing is reduced in relation to the quantity of units produced.

The cost structure of 3D printing, however, is fairly simple in contrast to traditional mass manufacturing. The main cost is electricity and the material; e.g. filament or powdered material, depending on the printing process. One significant expense is the design of the CAD file necessary for the print, which needs to be created from scratch or modified and "cleaned" from a 3D scan in case a CAD file does not already exist.[303] The 3D printer itself can easily be used to produce all kinds of different products without difficulties.[304] Due to the economies of scale of 3D printing, the cost per unit does not change significantly whether one prints out three or three million products.[305]

[303] Lipson – Kurman 2013, p. 47.
[304] Note that e.g. SLA 3D printers can only exploit certain photosensitive resins, FDM printers are restricted to materials that can be melted and extruded and LOM printers require the material to be found in sheets. Thus the 3D printing method sets restrictions on materials that can be used in printing. See Chapter 3 above.
[305] Figure 1 above shows the highly simplified cost structures of the two types of manufacturing in relation to the cost per unit and quantity of the produced units when producing low price range products. As is apparent from the figure, mass manufacturing of low-cost items becomes cheaper than 3D printing relatively quickly when the quantity of produced units increases above a certain limit (L). Beyond this limit, 3D printing the same products becomes unprofitable and thus the questions related to trade mark infringing acts become mainly hypothetical. No reasonable economic operator is going to 3D print a competitive product that is sold in large quantities and can be mass produced with traditional methods at a significantly cheaper price. See Lipson – Kurman 2013, p. 47.

Figure 1:[306]

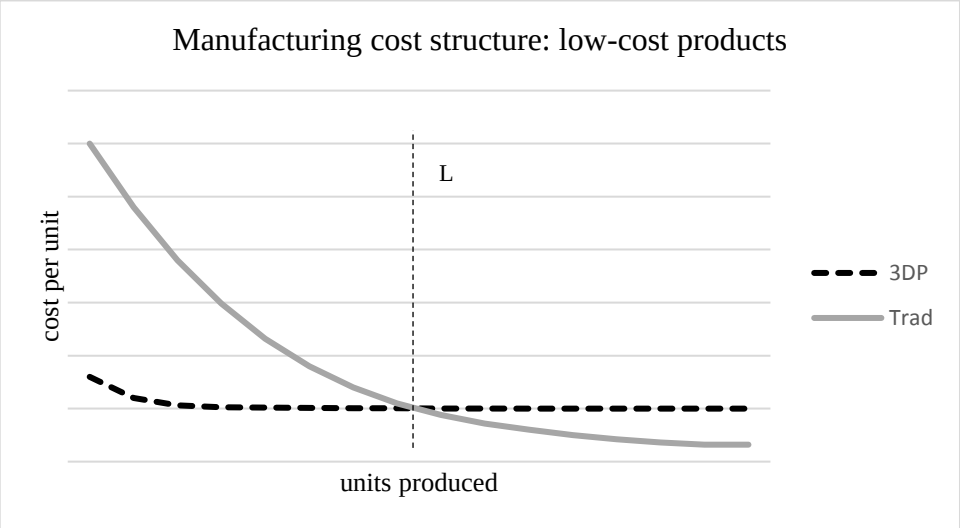
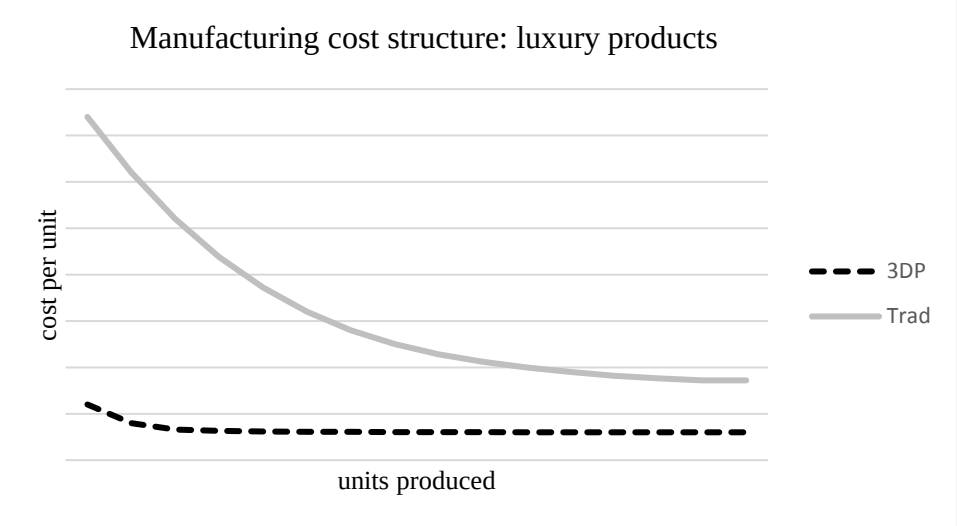


Figure 2:[307]



So what significance does the aforesaid have? As explained above, the shape of a product can usually achieve distinctiveness only through extensive use on the market. Therefore, the shape of a product cannot assumedly gain distinctiveness when a merely limited amount of the product is produced and subsequently offered on a market. The average consumer simply does not get acquainted with the shape and its connection to a certain producer when the consumer never comes across the product. Marketing strategies naturally play an

[306] It should be noted that this does not apply to different types of goods, and it does not exclude possible problems in relation to free-riding, blurring and tarnishment under Articles 5(3)(a) and 10(2)(c) TMD or Articles 8(5) and 9(2)(c) TMR.

[307] Figure 2 shows the cost per unit structure of 3D printing compared to traditional mass manufacturing of more expensive luxury items. Here the cost of mass manufacturing does not necessarily descend below the costs related to 3D printing, depending on the production process, the products being produced and pricing policies.

important a role in achieving consumer awareness but physical presence on the market e.g. in the form of extensive sales is usually necessary.[308]

Therefore, problems in relation to identical low cost competitive goods are unlikely. Since trade mark registration usually requires distinctiveness acquired through use and trade mark infringement requires use in the course of trade, and the exclusive right enables the proprietor to prevent the use of protected trade marks in relation to identical or similar goods,[309] the circumstances described in this subsection result in similar 3D printed low cost goods being unlikely to cause any problems in relation to trade mark protected shapes whatsoever. This is due to the fact that it is economically unfeasible to produce such competing goods using 3D printing technology. Theoretically, the risk of confusion exists, but in practice no reasonable commercial operator will undertake 3D printing of low-cost goods, such as the Toblerone chocolate bar[310], regardless of the existence of trade mark protection.[311]

In contrast, in relation to same or similar luxury competitive goods, the problematics in relation to likelihood of confusion are likelier to occur, since 3D printing such goods in the higher price range can be economically viable and even more profitable in comparison with traditional mass manufacturing.[312] Expensive and more exclusive products could easily be produced on a minor scale and even be individualised for each customer without adding significantly to the price.[313] One should note that the same applies to goods that are cheap to manufacture but sold at relatively high prices due to the pricing policy of the proprietor, i.e. high margins and high profits. A prime example of this is the Lego figurine[314], a small plastic toy which is cheap to manufacture but sold at a relatively high price. In such cases,

[308] For example Davis et al 2014, pp. 476–478. See Subsection 2.5.3 above on acquiring a three-dimensional trade mark through use. As mentioned above, registration of unused designs based on *ab initio* distinctive character as three-dimensional trade marks is also possible, but difficult to achieve in practice.
[309] Note that protection of trade marks with a reputation does not require use in relation to same or similar goods, nor does it require likelihood of confusion. See Subsection 4.2.6 below.
[310] EUTM registered trade mark number 000031237, owned by Kraft Foods Schweiz Holding GmbH.
[311] Offering 3D printed chocolate bars for a higher price might be economically feasible, and could be aimed towards a specific "tech-savvy" public. Such chocolate bars could be easily considered identical or similar goods, but the fact that the chocolate bars would be significantly more expensive and marketed heavily on the concept of 3D printing might just render them dissimilar enough to prevent likelihood of confusion. This is still merely speculation since no such cases have been tried at a court.
[312] This is usually the case with counterfeit luxury items that can be produced i.a. by 3D printing.
[313] The fact that the goods are individualised might affect the physical nature and users of the goods to such an extent that it would render them dissimilar, since bulk goods are usually perceived entirely differently in comparison with bespoke items.
[314] EUTM registered trade mark number 000050450, owned by LEGO Juris A/S.

3D printing can become an attractive alternative in the sense of manufacturing competing goods.

Due to the extensive adaptability of designs in 3D printing, product shapes are easily misappropriated. Thus, the threshold requirement of identical or similar goods or services plays an important part in balancing the interests of trade mark proprietors on the other hand and competitors, "prosumers" and user-creators on the other. As a concluding remark to this subsection, and in relation to altering the design of a shape protected by three-dimensional trade mark in order to exclude protection based on likelihood of confusion, some arguments are presented. Firstly, it can be suggested that already a different material used in 3D printing is enough to exclude likelihood of confusion. This is due to the aforementioned fact that when the choice of material significantly alters the physical nature and purpose of the product, the goods or services referred to by the shape mark are no longer similar and a "complete lack of similarity" can be found as to excluding any likelihood of confusion.[315] Secondly, a shape registered as a three-dimensional trade mark can be incorporated into the design of a product in connection with completely different goods or services when the design is altered in the CAD file form. Here, in case the trade mark does not have a reputation and extended protection cannot be sought, protection under Article 10(2)(b) TMD or Article 9(2)(b) TMR cannot be asserted when the goods are not similar. This leaves a clear gap in the protection of shape marks that do not possess a reputation, enabling certain abuse of registered three-dimensional trade marks.[316]

4.2.2. Relevant Public

Similarly to the process of assessing the distinctive character of a shape mark, the relevant public must always be determined when assessing likelihood of confusion. The relevant public may be limited to certain types of consumers, experts or entrepreneurs or a wide public. The distribution and marketing channels are also relevant in determining a level of awareness of the relevant public.[317] In its landmark judgment in the *Lloyd Schuhfabrik* case, the ECJ deemed the average consumer of the category of goods concerned as reasonably

[315] Regardless of the interdependence principle discussed above, a clear distinction between the goods or services can never be offset by identical trade marks.
[316] In addition to this, there are also other requirements that need to be met in order to afford protection against unauthorised use, such as use in the course of trade and that no legal limitation to the exclusive right exists. Such requirements do not apply to registering shape marks to dissimilar products that appropriate the shape of an earlier three-dimensional trade mark.
[317] Salmi et al 2008, p. 364.

well-informed and reasonably observant and circumspect.[318] The court further elaborated that the average consumer's level of attention is likely to vary according to the category of goods or services in question.[319] This leads to a higher possibility for likelihood of confusion to emerge when the public is not able to compare the goods in parallel and when purchases are concluded swiftly.[320] Thus, determining confusion depends a great deal on the rational behavioural shopping patterns of consumers.[321] It is therefore apparent that goods of higher price range or quality standards or goods of special technical nature induce a higher level of awareness for the relevant public.[322] From this point of view, it is also significant that the relevant public needs to rely on their imperfect recollection of the trade marks in question.[323]

In assessing likelihood of confusion in relation to 3D printing, the relevant public and the specific level of attention paid by the public of needs to be defined separately in each case. As discussed above, the composition and the level of attention of the relevant public varies in relation to the goods or services. Goods or services of higher price range attract usually more attention than bulk goods of daily use and more affordable prices. Also, owing to the technology itself, respective users of the goods might be quite different in connection with 3D printed products.[324] Since 3D printing is still quite a novel technology, and since there are not many wide-spread commercial applications, the relevant public is likely to be comprised of younger, technology-savvy users that are familiar with the new technology and share an interest in it.[325] *Ebrahim* has described such relevant public as the 3D printing enthusiast market segments, dividing the market into Do-It-Yourselfers as Innovators,

[318] *Lloyd Schuhfabrik*, para 26.
[319] *Ibid.*
[320] Palm 2002, p. 164. See also judgment per Mr Justice Laddie in the High Court of Justice (Chancery Division) in the case *Kimberley-Clark Limited v Fort Sterling Limited* [1997] F.S.R. 877, 21 April 1997, at 884: "*a typical weekly family shop among the 25,000 different items ranged in a typical supermarket takes 40 minutes. Consumers tend to scan the shelves and make rapid purchase decisions. Consumers spend less than 10 seconds on average in front of packaged grocery shelves.* […] *This combination of point of purchase decision making and rapid selection means that misleading packaging is particularly likely to influence consumer purchasing choices*."
[321] Morris 2012, p. 7.
[322] See e.g. judgment of the GC in the case T-742/14, *Alpha Calcit Füllstoffgesellschaft mbh v European Union Intellectual Property Office*, 19 July 2016, ECLI:EU:T:2016:418, para 46.
[323] Even consumers with a high level of attention need to rely on their imperfect recollection of trade marks; see e.g. judgment of the GC in the case T-443/12, *Equinix (Germany) GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 21 November 2013, ECLI:EU:T:2013:605, para 54.
[324] Ebrahim 2016a, p. 15. *Ebrahim* suggests that a chasm has developed between the early adopters and the mainstream market resulting from the adoption of 3D printing.
[325] It should be noted that as the technology is gradually becoming more widespread, the concept of relevant public will also expand to cover a wider group of consumers. This means that the scope of protection of the exclusive right will extend when likelihood of confusion will be assessed in relation to a wider public with less detailed knowledge of the technology. On the other hand, this development will diminish the scope of protection from another angle when likelihood of confusion will be less likely when the relevant public will be more acquainted with the technology. See Cornthwaite 2012, p. 132.

Tinkerers as early adopters, "Prosumers" as the early majority, consumers as the late majority, and Skeptics as laggards.[326] Such users might also be ready to pay more for goods merely because the goods were produced by 3D printing.

4.2.3. Identical or Similar Marks: Global Appreciation

The starting point for the evaluation of similarity of the sign and the mark is to determine the earlier mark and the respective scope of the exclusive right.[327] The main principle underlying the subsequent assessment is that the evaluation takes into account all relevant circumstances.[328] In addition to the distinctive and dominant parts of the opposing trade marks, also the possible visual, aural and conceptual similarity, the goods or services for which the junior trade mark is sought and the senior mark is registered, the level of awareness of the relevant public and all other relevant circumstances are taken into account.[329] The global appreciation view was justified in *Sabel* by the fact that an average consumer normally perceives a trade mark as a whole and therefore does not proceed to analyse its various details.[330] Nor do consumers usually take time to closely compare the two items with one another, but the comparison is based on an imperfect recollection.[331]

The preamble of the Trade Mark Directive[332] emphasises the appreciation of numerous elements and in particular the level of recognition of the trade mark on the market, the association between the marks and the degree of similarity between the mark and the sign and between the goods or services.[333] This means that where at least some degree of similarity between the signs and the relevant goods or services exists, an assessment of

[326] In his assessment, *Ebrahim* employed the so-called "Technology Adoption Life Cycle" model as proposed by *Moore*. See Moore 2001, pp. 7–10 and Ebrahim 2016a, pp. 4 and 17.
[327] Pakarinen 2006b, p. 52. The earlier mark can be registered or acquired through use, provided that the conditions set out in the previous chapters are met. Where the earlier mark has been registered, it will be assessed as it stands on the register.
[328] *Sabel*, para 22 and *Lloyd Schuhfabrik*, para 18.
[329] UK Intellectual Property Office 2016, pp. 151–152. Pakarinen has pointed out that the CJEU's emphasis on global appreciation is leaving more space for interpretation carried out by the courts of Member States. This is due to the fact that the CJEU is cautious to present its opinions on any matters outside the subject matter of the specific questions referred to it for preliminary ruling. See Pakarinen 2006a, pp. 82–83.
[330] *Sabel*, para 23.
[331] *Lloyd Schuhfabrik*, para 26 and order of the ECJ in the case C-440/16 P, *Staywell Hospitality Group Pty Ltd v European Union Intellectual Property Office*, 12 January 2017, ECLI:EU:C:2017:16, para 5.
[332] Recital 16 of the Preamble of the TMD. The same has been stated in Recital 8 of the Preamble of the TMR.
[333] These particular points of evaluation were also included in the preambles of the earlier Trade Mark Directives as such and have been later confirmed in practice by the ECJ in i.a. *Sabel* and *Canon* cases. See Preamble 10 of the Directive 89/104/EEC to approximate the laws of the Member States relating to trade marks and Preamble 11 of the Directive 2008/95/EC to approximate the laws of the Member States relating to trade marks and ECJ judgments in *Sabel*, para 22 and *Canon*, para 17.

likelihood of confusion is to be carried out. This assessment involves an iterative process that weighs up all the relevant factors, and it is carried out in the global assessment phase.[334]

Likelihood of confusion must always be demonstrated, there is no presumption on the existence of likelihood of confusion – not even in relation to marks with a reputation.[335] There has traditionally been differentiating approaches to the matter. For example German trade mark law has traditionally only required that there is a mere *possibility* that the relevant public is confused as to the origin of the goods or services.[336] In the UK, the emphasis has been on the practical impact the junior mark is likely to have on probable customers, given the expectations that they already have and the amount of attention that they will pay.[337] In *Lloyd Schuhfabrik*, Advocate General Jacobs observed that the likelihood of confusion, based on the global assessment, must be *properly substantiated* and *genuine* and not merely hypothetical or remote, when taking into account the presumed expectations of an average consumer of the goods or services in question who is reasonably well informed and reasonably observant and circumspect.[338] This interpretation promotes heavily the Anglo-American view mentioned above, leading EU trade mark law away from the German legal tradition. However, digitalisation and the internet might steer this development back towards the traditional German interpretation. In *Google France*, the ECJ found that the mere vagueness in relation to the economic origin of the goods or services where normally informed and reasonably attentive internet users are left in doubt leads to an adverse effect on that function of the trade mark, i.e. likelihood of confusion.[339]

The global appreciation of the visual, aural or conceptual similarity of the marks in question must be based on the overall impression given by the marks, bearing in mind in particular their distinctive and dominant components.[340] Dominant components should not be considered in isolation from the other components, unless the impact of such components

[334] EUIPO Guidelines for Examination of EU Trade Marks 2017, Part C, Section 2, Chapter 7, p. 4.
[335] *Adidas*, paras 33, 39 and 41.
[336] The German interpretation has been seen as judicial and largely based on legal criteria, in contrast to Anglo-American interpretation emphasising the factual perception of the relevant public, according to which more than a mere hypothetical possibility of the existence of likelihood of confusion is required. See Palm 2002, pp. 128, 161 and 189.
[337] Cornish – Llewelyn – Aplin 2013, p. 666.
[338] Opinion of Advocate General Jacobs in the case C-342/97, *Lloyd Schuhfabrik Meyer & Co. GmbH v Klijsen Handel BV*, 29 October 1998, ECLI:EU:C:1998:522, para 20.
[339] Judgment of the ECJ in the joined cases C-236/08 to C-238/08, *Google France SARL and Google Inc. v Louis Vuitton Malletier SA* (C-236/08), *Google France SARL v Viaticum SA and Luteciel SARL* (C-237/08) *and Google France SARL v Centre national de recherche en relations humaines (CNRRH) SARL and Others* (C-238/08), 23 March 2010, ECLI:EU:C:2010:159, para 90.
[340] *Sabel*, para 23.

is negligible.[341] In *Lloyd Schuhfabrik*, the ECJ held that only one of the said elements can be enough to constitute likelihood of confusion.[342] The assessment should, however, always be global and take into account all relevant circumstances. Thus a high level of e.g. visual similarity cannot be understood as overriding the need for a comprehensive and *ad hoc* global assessment.

In relation to combinations of different marks and other elements, the comparison must be made by examining each of the marks in question as a whole. However, this does not mean that the overall impression conveyed to the relevant public by a composite trade mark may not, in certain circumstances, be dominated by one or more of its components.[343] It should be noted, however, that where the goods or services are identical, likelihood of confusion may emerge on the part of the public where a sign is composed by juxtaposing a company name of another party that has a reputation and a registered mark which has normal distinctiveness and which, without alone determining the overall impression conveyed by the composite sign, still has an independent distinctive role therein.[344] Therefore, regardless of the global appreciation of composite signs, the proprietor of a mark with a reputation cannot thus misappropriate an earlier shape mark by juxtaposing it with another mark with a higher level of reputation.

As discussed above in connection with the German doctrine of *Motivschutz*,[345] the conceptual similarity is a problematic concept in trade mark law and should be treated with caution.[346] Conceptual similarity as such can evoke likelihood of confusion only in exceptional circumstances, mainly where the signs have the same distinctive concept in common accompanied by visual similarities between the signs. In such cases, likelihood of confusion may emerge even in the absence of a particularly high distinctive character of the earlier mark.[347] In relation to the other elements, conceptual similarity may not be sufficient to outweigh the visual and phonetic differences, especially if the common concept is non-

[341] Judgment of the ECJ in the case C-498/07 P, *Aceites del Sur-Coosur SA v Koipe Corporación SL and Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 3 September 2009, ECLI:EU:C:2009:503, para 62.
[342] *Lloyd Schuhfabrik*, para 28.
[343] Order of the ECJ in the case C-3/03 P, *Matratzen Concord GmbH, formerly Matratzen Concord AG v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 28 April 2004, ECLI:EU:C:2004:233, para 32.
[344] Judgment of the ECJ in the case C-120/04, *Medion AG v Thomson multimedia Sales Germany & Austria GmbH*, 6 October 2005, ECLI:EU:C:2005:594, paras 34 and 37.
[345] See Subsection 4.1.1 above.
[346] See e.g. judgment of the ECJ in the case C-51/09 P, *Barbara Becker v Harman International Industries Inc*, 24 June 2010, ECLI:EU:C:2010:368, paras 39–40.
[347] EUIPO Guidelines for Examination of EU Trade Marks 2017, Part C, Section 2, Chapter 7, p. 9.

distinctive.[348] On the contrary, conceptual differences between signs may counteract their visual and phonetic similarity.[349]

Likelihood of confusion is greater in connection with earlier trade marks of a higher level of distinctiveness,[350] inherent or acquired through use.[351] This means that highly distinctive trade marks obtain a wider scope of protection than less distinctive trade marks.[352] Thus, the independent economic value of a trade mark is also better protected in relation to marks with a distinctive character.[353] The more dominant parts of the trade mark, i.e. features that make the mark memorable,[354] are emphasised in the evaluation and less distinctive parts are given less weight.[355] However, the less distinctive parts of the trade marks are still taken into account in the overall evaluation.[356]

Some scholars have argued that this should be the other way around; more distinctive character would decrease the likelihood of confusion since the relevant public is more prone to remember the specific trade mark and separate between similar marks more easily.[357] For example, *Roncaglia* has argued in favour of this point to the extent that famous trademarks would be so well ingrained in the memories of consumers that they would be able to distinguish them even from other very similar signs on similar products.[358] *Phillips* suggested a similar view by arguing that consumers are more likely to confuse trade marks which they are less familiar with and which possess less distinctive character.[359] On the contrary, as *Palm* has put it, marks with distinctive character appear on the market in several different manners and usually in several different variations, attracting more of the consumers' attention while consumers assume to see them everywhere. This means that

[348] Judgment of the GC in the case T-54/12, *K2 Sports Europe GmbH v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 31 January 2013, ECLI:EU:T:2013:50, para 49.
[349] *Ruiz-Picasso*, para 20.
[350] *Sabel*, para 24.
[351] Folliard-Monguiral – Rogers 2003, p. 177.
[352] Salmi et al 2008, p. 292–293.
[353] Palm 2002, p. 186.
[354] Cornish – Llewelyn – Aplin 2013, p. 743.
[355] E.g. judgment of the Finnish Supreme Court in the case KKO 2004:49, volume number 1191, 30 September 2003, paras 14–15.
[356] Salmi et al 2008, p. 305.
[357] E.g. Tiili 1972, pp. 280–281.
[358] Roncaglia 1998, pp. 553–554. *Davis et al* have raised similar arguments in relation to trade marks that have acquired a reputation through extensive use on the market, becoming highly distinctive and thus resulting in consumers noticing even slight differences between the distinctive mark with a reputation and a similar mark. See Davis et al 2014, pp. 536–537.
[359] Phillips 2003, p. 352.

likelihood of confusion arises easier in connection with marks of highly distinctive character, especially as likelihood of indirect confusion or association.[360]

4.2.4. Identical Trade Marks and Identical Goods or Services: Reproduced Shapes

In a case concerning identical trade marks that are used with identical goods or services, the likelihood of confusion does not have to be demonstrated, but the protection against identical marks is absolute.[361] This form protection is based on Articles 5(1)(a) TMD and 8(1)(a) TMR concerning the relative grounds for refusal or invalidity of registration and Articles 10(2)(a) TMD and 9(2)(a) TMR concerning the scope of the proprietor's exclusive right. Even though protection afforded under said provisions does not include the evaluation of likelihood of confusion in a technical sense and is therefore mainly outside the scope of this research,[362] some remarks should still be made on the subject.

It should be noted that harm to the functions of the trade mark is still required in order for protection to be afforded, as was held in *Arsenal* and *Google France*.[363] Therefore, likelihood of confusion is still apparent, but it is assumed as sufficiently likely.[364] This means that protection afforded against identical marks in identical goods or services is strong, and the twin identities should therefore be strictly interpreted.[365] This has not, however, been the case in more recent CJEU case law as demonstrated below.

---

[360] Palm 2002, p. 176. It should be noted, however, that two separate concepts of reputation and distinctiveness are involved in the arguments, and often used together in a manner that might cause ambiguity. Bearing the distinction between the concepts in mind, it can be argued that the reputation of the earlier mark is of more significance. Even highly distinctive marks can easily be confused with similar signs when customers are not familiar with them. For example, as *Davis et al* have pointed out, no one is going to confuse VERSACE with SERFACE but that might be the case if the mark did not possess a high level of reputation that it does. On the contrary, the higher the degree of reputation possessed by a mark, the less likely the consumers are to confuse it with similar signs, even when it has less distinctive character. Affording a wider scope of protection for trade marks with more distinctive character is also well-founded from an economic perspective. Highly distinctive marks are usually more difficult to create than generic, less distinctive marks. In a scenario where marks with a high level of distinctive character were provided less protection based on the notion that they are less likely to be confused with similar trade marks, the incentive for creating trade marks with distinctive character would be seriously hindered. See Davis et al 2014, pp. 536–537.

[361] Cornish – Llewelyn – Aplin 2013, p.736.

[362] It is noteworthy that the forms of protection afforded against identical marks and similar marks have been seen as identical; for example *Ribbons* has argued that the only difference between Articles 5(1)(a) and 5(1)(b) TMD is who bears the burden of proof. *Blythe* has also noted that following *Google France*, the likelihood of confusion will at times need to be assessed in relation to infringement claims under Article 5(1)(a) TMD. See Ribbons 2011, pp. 435–436 and Blythe 2015b, p. 715. Similarly, earlier Finnish trade mark law did not even draw a distinction between the two forms of protection. See *supra* 214.

[363] *Arsenal*, para 54 and *Google France*, para 76. See Section 4.3 below.

[364] Cornish – Llewelyn – Aplin 2013, p. 736.

[365] *Ibid*, p. 758.

In order to be seen as identical, the two trade marks do not need to be absolutely identical, but a high level of similarity suffices.[366] The two trade marks can be found identical when a junior mark repeats unaltered all the main elements of the senior mark, or, based on an overall assessment, the junior mark differs from the senior mark so slightly that the average consumer cannot tell the difference between the marks.[367] In recent CJEU case law the scope of protection afforded against identical marks has been expanded by the *Portakabin* judgment, where misspellings of the trade mark were considered identical to the trade mark.[368] This change of interpretation in CJEU case law has been seen to conflate Article 10(2)(a) and 10(2)(b) TMD protection.[369] This conflation is also likely to increase the significance of Article 10(2)(a) TMD in likelihood of confusion cases, since the scope of absolute protection is expanding to cover situations where identity is not necessarily that apparent. From the point of view of the proprietor, protection afforded under this article is welcomed since it reduces the burden of proof significantly since likelihood of confusion is assumed. Due to the aforesaid, trade mark protection under Article 10(2)(a) TMD could prove an effective manner of combating counterfeit 3D printed goods, closely resembling the original product protected by a three-dimensional trade mark.

Another question to consider is whether the fact that the product was 3D printed is enough to render it outside the meaning of "identical" or not. Furthermore, one may wonder whether it is enough to exclude likelihood of confusion, when the quality of the scan and subsequently printed product is apparently low. As established above in Chapter 3, most 3D printed products bear certain characteristics, such as a layered surface, due to the nature of the manufacturing process. This means that a product manufactured by traditional means is slightly different compared to a 3D printed product regardless of the identical design. As *Bradshaw et al* have pointed out, 3D printing does not produce an exact copy of the original object, unlike e.g. digital music file sharing does in digital music files.[370] Due to this, the technology does not provide for the reproduction of faithful copies as such, but concerns

[366] Salmi et al 2008, p. 285.
[367] Judgment of the ECJ in the case C-291/00, *LTJ Diffusion SA v Sadas Vertbaudet SA*, 20 March 2003, ECLI:EU:C:2003:169, para 54.
[368] Judgment of the ECJ in the case C-558/08, *Portakabin Ltd and Portakabin BV v Primakabin BV*, 8 July 2010, ECLI:EU:C:2010:416, para 48. The ECJ left, however, the final determination to the national court whether the misspellings in the case were insignificant enough to be seen as identical to the trade mark.
[369] Simon Fhima 2014, p. 154.
[370] The CAD file can be, and usually is, identical to the original design, e.g. when the original design files have been distributed online, but the similarity of the resulting print to the original product depends on various other factors such as the level of sophistication of the printer and materials used.

the sharing of reverse-engineered designs, not original design documents.[371] This depends on the level of sophistication of the 3D printer, since cheaper 3D printers used by consumers produce items of restricted details and materials, whereas expensive industrial-grade 3D printers are able to create objects of higher precision and broader variety of materials, even in a single print. This would imply that the reproduction of a three-dimensional trade mark by 3D printing would not be objectionable under Article 10(2)(a) TMD or Article 9(2)(a) TMR in case the 3D printer is of a lower price range and unable to produce exact copies of the product.

However, since in *Portakabin*, the ECJ employed a broader test for identical trade marks, the forms of protection under Articles 10(2)(a)–(b) TMD were conflated. This has resulted in a broader interpretation of identity that could, in principle, enable protection under Article 10(2)(a) TMD also in cases where a product protected by a shape mark is 3D scanned and subsequently printed, despite the certain differences in the goods owing to the inherent characteristics of 3D printed products.[372] However, this would apply only in cases where the goods or services are identical and the printed object is otherwise similar to the protected shape, i.e. the junior sign would not be significantly different due to different material composition or appearance.

The aforesaid could be the case for example in look-a like products intended to capture market share of the earlier mark. Three-dimensional trade mark protection is, justifiably, difficult to achieve, but it provides strong protection for a certain distinctive shape in cases of double identity.[373] It is therefore especially effective against so-called look-a like products, i.e. products that mimic the shape or design of a senior product.[374] In order to balance the proprietary protection and the interests of competitors and properly functioning market, the scope of protection is quite narrow. Look-a like products may still harm the

[371] Bradshaw – Bowyer – Haufe 2010, pp. 30–31. It should be noted that the technology is developing at a rapid pace, and this conclusion might be outdated after some time. Also, trade mark proprietors might share the original design files and printer configuration with consumers, resulting in prints closer resembling the "original item".
[372] This question is likely to diminish in significance in correlation with further developments of 3D printing technologies, enabling better quality reproductions of original items. See *ibid*.
[373] E.g. Johnson 2015 and judgment of the ECJ in *Mag Instrument*, and judgment of the GC in the case T-262/04, *BIC SA v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 15 December 2005, ECLI:EU:T:2005:463.
[374] Salmi et al 2008, p. 205.

earlier trade mark, since they can easily be associated with it, but are usually sold at a cheaper price and lower quality.[375]

The discussion above implies that, apart from 3D printed identical look-a like products or counterfeits, likelihood of confusion in accordance with Article 10(2)(b) TMD would be better suited for most cases of claiming protection against similar shapes in case the senior mark does not have a reputation. In the future, as 3D printers evolve further and reach the possibility to reproduce a "genuine" product almost perfectly,[376] protection under Article 10(2)(a) TMD is likely to gain more significance in 3D printing.

4.2.5. Similar Marks in 3D Printing: Altered Shapes

In case the design is not reproduced as it is and Articles 5(1)(a) or 10(2)(a) TMD cannot be applied to prohibiting the use or registration of the 3D printed object, the existence of likelihood of confusion needs to be asserted in order to claim protection under Articles 5(1)(b) or 10(2)(b) TMD. As discussed above, actual confusion of the relevant public does not have to be established, merely the possibility of likelihood of confusion needs to be existent. Even the existence of mere vagueness causing uncertainty on the origin of the goods or services may result in finding likelihood of confusion.[377]

As explained above, the first step of assessing the identity or similarity of marks is characterised by making a global appreciation of the sign and the registered mark in question. Dominant parts of the shapes in question and the distinctiveness of the earlier shape mark are emphasised in the assessment, but all relevant circumstances are taken into account. The level of distinctive character of the earlier mark is also determined, since it impacts the assessment. Subsequently, the visual, aural and conceptual similarities are considered. Aural similarity is naturally excluded from the assessment of shape marks, but visual and conceptual similarity are relevant when assessing likelihood of confusion in relation to three-dimensional trade marks.[378] Especially visual similarity is emphasised and similarity in relation to only one of the elements can be sufficient to establish likelihood of confusion, if not outweighed by clear differences in other elements.

[375] For a more elaborate assessment of look-a like products and their impact on trade marks, see Mills 1995, pp. 119–129 and Palm 2002, pp. 216–257.
[376] Hornick 2015, p. 814.
[377] *Google France*, para 90.
[378] Phillips 2003, pp. 322–323.

In relation to composite signs and hybrid shapes, which are relatively easily created by 3D printing, the proprietor of a mark with a reputation – such as the Coca-Cola bottle – cannot misappropriate an earlier shape mark by juxtaposing it with the other mark with a higher level of reputation.[379] Thus the use of registered shape marks or shape marks established through use cannot be maliciously incorporated into the designs of shape marks with a reputation, regardless of the fact that they would appear less distinctive in the overall assessment.[380]

As already noted in connection with the assessment of identical or similar goods or services, different materials used in 3D printing can be significant. In case the contours of the shape are similar but the texture and appearance differ significantly, likelihood of confusion is diminished. On the other hand, the protection concerns the naked shape as such, therefore already the fact that the shape is similar can be enough to constitute likelihood of confusion. Similar shapes can be understood by the relevant public as e.g. low price-range or exclusive and expensive products of the same producer, depending on the material and level of details incorporated into the product. Even though materials are more important in assessing the similarity of goods or services, they bear importance also in the assessment of the identity or similarity of marks.

Individualisation is an important aspect of assessing likelihood of confusion in 3D printing.[381] When a product, usually a more expensive one, is customised to the needs of the consumer, the fact that the shape is altered is likely to affect the possibility that likelihood of confusion emerges.[382] Still, in case the level of conceptual similarity is high and visual similarity is not apparently low, likelihood of confusion can be found even though the product would be customised to an extent, and vice versa. Since the dominant and distinctive parts are taken into account, individualisation that does not alter such

[379] *Medion*, paras 34 and 37.
[380] Here the concepts of distinctive character and reputation should be kept separate. A higher level of reputation or a higher level of distinctive character have both been understood as to increase the risk of confusion.
[381] This has been argued at least in the US by *Osborn*, and due to the similarity of the regimes the same should apply to EU trade mark law as well. See Osborn 2014, pp. 585–586. When considering the matter from the point of view of the essential function, extensive individualisation of goods resulting in a plethora of different shapes might diminish the perception of consumers of shapes indicating a certain economic origin, but the trade channels have more significance. Consumers are unlikely to confuse the economic origin in case they order a product from a certain company and request the product to be design similarly to another company's products. Here the possible post-sale confusion could, however, be relevant.
[382] Note that individualisation might also render the goods or services dissimilar in some cases, e.g. when the shape of a Coca-Cola bottle is used in creating custom-made bottles with a different purpose and nature. Here also the distribution channel and other circumstances surrounding the sale are relevant to the assessment.

elements of the shape will not render the altered shape outside the scope of protection afforded against likelihood of confusion. Thus, "tinkering" with the design file must alter the dominant and distinctive parts of the shape and thus the visual and conceptual similarity quite significantly in order to exclude likelihood of confusion. The global appreciation of the sign and the registered mark is thus emphasised also in this comparison.

4.2.6. Extended Protection of Marks with a Reputation

The aforementioned requirement for same or similar goods or services does not apply, when a trade mark has a reputation, i.e. when it is widely recognised in its area of protection. Trade mark protection is wider for trade marks with a reputation since they gain protection regardless of the goods or services. According to Article 5(3)(a) TMD and Article 8(5) TMR, the proprietor of an earlier mark can prevent the registration of a later mark when the earlier mark has a reputation and the later mark is identical with or similar to the earlier mark, irrespective of whether the goods or services for which it is applied or registered are identical with, similar to *or not similar to* those for which the earlier trade mark is registered.[383] Protection is thus granted also in situations where the goods or services are same or similar. This has been elaborated in the recently revised wordings of the TMD and TMR explained above, but the revision only consolidated the legal state as it has been acknowledged already in the *Davidoff* judgment of the ECJ in 2003.[384] Due to this, extended protection of marks with a reputation appears as an alternative claim for proprietors with famous trade marks. In order to be seen as a trade mark with a reputation, the mark must be known by a significant part of the public concerned by the products or services which it covers.[385]

[383] Additional requirements are imposed on affording protection, e.g. that the use of the trade mark applied for is without due cause and would take unfair advantage of, or be detrimental to, the distinctive character or the repute of the earlier trade mark, i.e. the use of the mark would result in free-riding, blurring or tarnishing. Also, the wordings of the aforesaid provisions imply that the earlier mark with a reputation needs to be registered in order to be able to invoke the wider scope of protection. This interpretation has been supported by the CJEU. See Landes – Posner 2003, pp. 206–209 and e.g. judgment of the GC in the case T-150/04, *Mülhens GmbH & Co. KG v Office for Harmonisation in the Internal Market (Trade Marks and Designs)*, 11 July 2007, ECLI:EU:T:2007:214, para 55.

[384] Judgment of the ECJ in the case C-292/00, *Davidoff & Cie SA and Zino Davidoff SA v Gofkid Ltd*., 9 January 2003, ECLI:EU:C:2003:9, para 30.

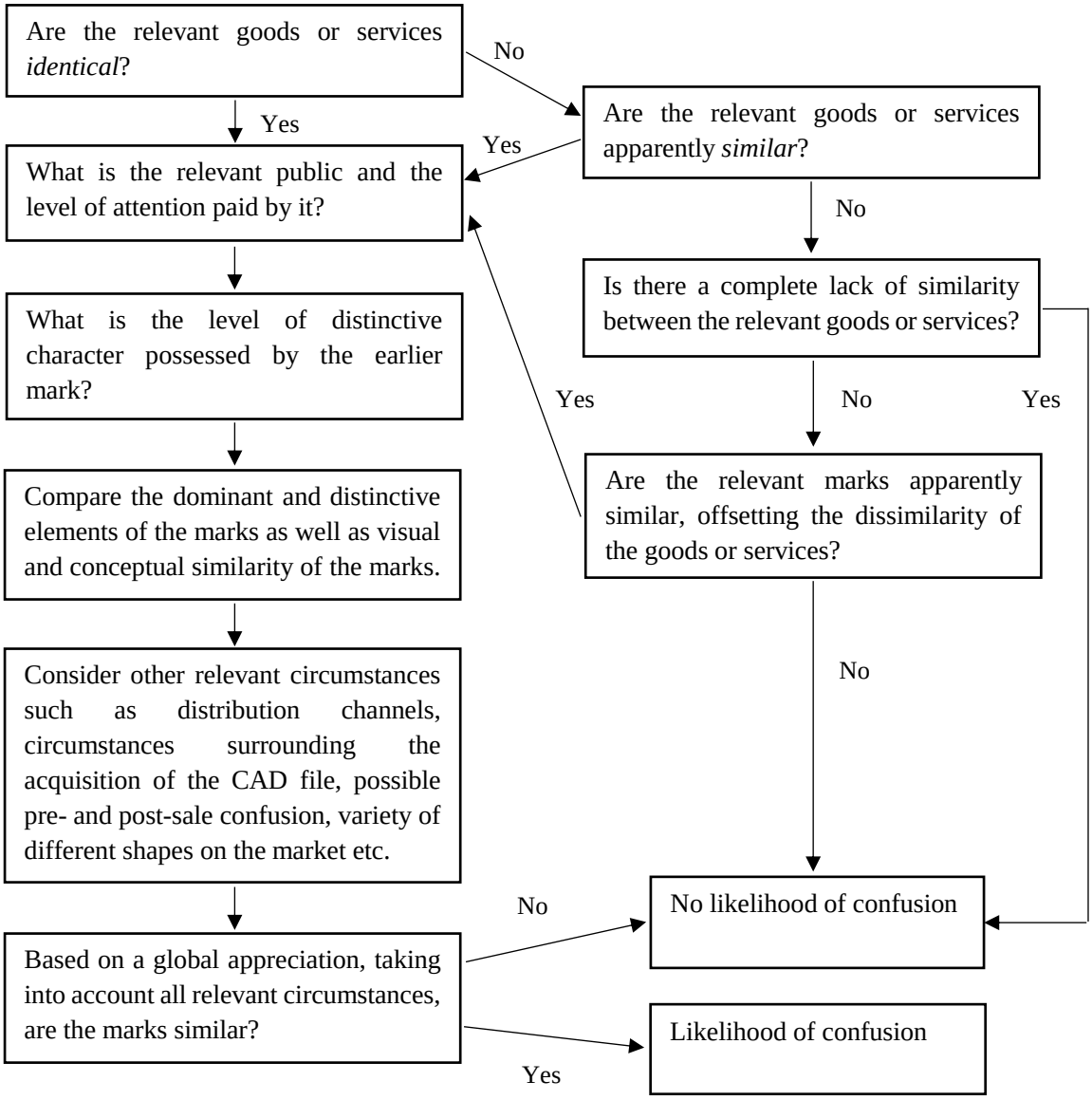
[385] Judgment of the ECJ in the case C-375/97, *General Motors Corporation v Yplon SA*, 14 September 1999, ECLI:EU:C:1999:408, para 31. This wording of the ECJ in its *Chevy* judgment has been seen to imply that the level of reputation required for extended protection is lower than the requirement for reputation of trade marks established through use. See Pontoppidan 2000, pp. 47–50.

In *Adidas-Salomon*, the ECJ found that no likelihood of confusion is required in implementing Article 10(2)(c) TMD.[386] Instead, a level of similarity by virtue of which the relevant section of the public makes a connection between the used sign and the registered mark suffices, i.e. the relevant public establishes a *link* between the sign and the mark even though it not confusing them.[387] Thus, this wide form of protection enjoyed by well-known trade marks only requires identical or similar marks, not likelihood of confusion.[388] Therefore, this form of protection should be kept separate from protection afforded against likelihood of confusion.[389] Likelihood of confusion is still usually a part of the claim, since it automatically fulfils the criteria for a connection set out in Article 10(2)(c) TMD.[390] In a case where there is no confusion, damage to the trade mark with a reputation can be difficult to demonstrate.[391] Likelihood of confusion is also assessed similarly in connection with marks with a reputation than under the previously discussed forms of protection.[392]

High price-range products can be protected against 3D printed cheap copies of e.g. inferior quality, due to e.g. material choices based on the extended protection, since such products could adversely affect brand reputation.[393] Thus, protection against cheaper copies is justifiable since the possibility to sell cheaper copies of a branded product blurs the proprietor's trade mark.[394] Here likelihood of confusion is not required but only a connection between the 3D printed products and the registered mark, establishing a link between them. Due to the wide range of protection, extended protection of marks with a reputation can be used in prohibiting a wide variety of different adaptations of the registered shape mark produced by 3D printing.

[386] Judgment of the ECJ in the case C-408/01, *Adidas-Salomon AG and Adidas Benelux BV v Fitnessworld Trading Ltd*, 23 October 2003, ECLI:EU:C:2003:582, para 31.
[387] *Ibid*, para 29 and *L'Oréal*, para 36.
[388] *Adidas*, para 36.
[389] Pakarinen 2006b, p. 54.
[390] *Intel*, para 57.
[391] Cornish – Llewelyn – Aplin 2013, p. 738.
[392] Also, the assessment of "connection" has similarities to the assessment of likelihood of confusion; it is similarly based on global appreciation, taking into account all relevant circumstances. See judgments of the ECJ in *Intel*, paras 41–57 and *Adidas-Salomon*, para 30.
[393] This has been argued at least in the US. See e.g. Ebrahim 2016a, p. 32.
[394] Landes – Posner 2003, pp. 208–209.

To conclude this section, the assessment process of likelihood of confusion in the context of 3D printing can be presented in a following flow chart:[395]



4.3. Likelihood of Confusion in Relation to the Proprietor's Exclusive Right

Naturally, the exclusive right is not without its exceptions. Due to the dichotomy between IPR owners and other actors in the market, the exclusive right provided by the trade mark right to the proprietor is not absolute and unlimited. The extent given to the exclusive right of the proprietor and exceptions to the right defines the scope of trade mark protection.[396]

[395] The legal basis for the assessment of likelihood of confusion in the flow chart is based on Articles 5(1)(b) and 10(2)(b) TMD and Articles 8(1)(b) and 9(2)(b) TMR.
[396] Pakarinen 2006b, p. 46 and Finnish Government Bill 24/2016 vp, p. 7.

Since the notion of likelihood of confusion is the same in relation to relative grounds for refusal or invalidity of trade mark registration as well as in relation to the scope of the exclusive right of the proprietor, the evaluation of likelihood of confusion is also the same in both situations. Protection in the latter case, however, requires certain additional criteria to be fulfilled.[397] In this section, such specific requirements for the application of Article 10(2)(b) TMD or 9(2)(b) TMR will be briefly assessed.[398]

4.3.1. Use in the Course of Trade

In relation to trade mark infringements, the proprietor enjoys the exclusive right to use the trade mark in the course of trade. It should be noted that this does not categorically exclude all activities of private individuals since uploading a CAD file infringing trade mark rights on the internet in the purpose of gaining economic benefit renders the activity in the sphere of trade mark protection. In *Arsenal*, use in the course of trade was characterised as taking place "in the context of commercial activity with a view to economic advantage and not as a private matter".[399] This is not a definition of use in the course of trade, as *Phillips* points out, but an observation of the circumstances that usually occur in connection with such use.[400] Thus, the concept of use in the course of trade is a widely interpreted requirement, encompassing all kinds of activities that aim at procuring a financial benefit, especially in the form of promoting sales of goods or services. It takes into account the extent to which the use is related to artistic or informative purposes.[401] The broad interpretation of use has also been confirmed by the CJEU. For example in *Google France*, the ECJ found that the lists of different types of uses found in Article 10(3) TMD and Article 9(3) TMR are non-

[397] See e.g. judgment of the ECJ in the case C-533/06, *O2 Holdings Limited and O2 (UK) Limited v Hutchison 3G UK Limited*, 12 June 2008, ECLI:EU:C:2008:339, para 57.
[398] The same requirements are applied in connection with Articles 10(2)(a) and 10(2)(c) TMD and Articles 9(2)(a) and 9(2)(c) TMR, with some exceptions due to the different scopes of protection. Differences arise especially in relation to the requirement of harm to the functions of the trade mark.
[399] *Arsenal*, para 40. Furthermore, the ECJ proceeded to find that the use of the sign by a third party must "affect or be liable to affect one of the functions of the mark". See *Arsenal* para 42.
[400] The requirement for an effect on the functions of the trade mark broadens the scope of relevant circumstances from the characteristics of the actions of the user of the junior mark to the consequences of such use. See Phillips 2003, pp. 205–206.
[401] Pihlajarinne 2009, pp. 128–131 and 276–280. The wide interpretation has been applied especially in the internet context, and implications of such extensive interpretation are affecting the general principles of trade mark and sign right law. As *Pihlajarinne* points out, in German legal literature it has been suggested that the registration and subsequent use of a web domain already renders the activity in the course of trade, unless the assumption is refuted. See e.g. Mueller-Stofen 1997, pp. 598–599.

exhaustive.[402] This requirement is extremely flexible and thus well suited for legal questions emerging in the wake of digitisation.

The requirement of use in the course of trade entails a prerequisite that the activities carried out are aimed at procuring an economic benefit. Digitalisation has brought about new business models and simultaneously blurred the line between private and commercial use, which is apparent especially in the 3D printing industry. The requirement of use in the course of trade has, however, been interpreted widely, and it can be applied relatively easy in vague situations situated in the grey area between commercial and private use. As a main rule, consumer 3D printing for personal use cannot be seen as trade mark infringing activity since it falls outside the requirement of use in the course of trade.[403] Trade marks become relevant only when 3D printing takes place in a commercial context, e.g. when an entrepreneur prints 3D designs protected by a third party's trade mark in order to offer them on the market.[404]

4.3.2. Use as a Sign and Harm to the Functions of Trade Mark Protection

One of the complex questions relating to the assessment of likelihood of confusion is whether it is required that a shape similar to the senior three-dimensional trade mark is used as a sign, i.e. as a trade mark in indicating the economic source or origin of the goods or services for likelihood of confusion to emerge. European trade mark law becomes especially ambiguous and subject to conflicting CJEU judgments in relation to the requirement of using a mark as a sign.[405] The wording of Article 10(2) TMD does not require use as a sign *per se*.[406] Advocate General Jacobs has stated that no such need for use as a sign is apparent from the wording, history or structure of Article 10 TMD.[407] An *e contrario* deduction can be made from Article 10(6) TMD. It can be reasoned that the Directive does not provide protection in situations where there is no use as a sign, i.e. use for the purposes of

[402] *Google France*, para 65. The same interpretation has been confirmed by the ECJ also e.g. in *Arsenal*, para 38 and *Adam Opel*, para 16.
[403] Mendis 2013, p. 162.
[404] Another example of use in commerce are 3D printing services such as Shapeways, which is a service that enables 3D designers to easily sell their work online. Designers of three-dimensional shapes can thus monetise their models, while the service, i.e. Shapeways, takes care of payments, manufacturing, distribution and customer service. See 3DPrinting.com: Compare 3D printing services <https://3dprinting.com/3d-printing-service/>, last visited on 6 April 2017.
[405] Bradshaw – Bowyer – Haufe 2010, p. 29.
[406] The wording "using in the course of trade, in relation to goods or services" is similar in Article 9(2) TMR.
[407] Opinion of Advocate General Jacobs in the case C-2/00, *Michael Hölterhoff v Ulrich Freiesleben*, 20 September 2001, ECLI:EU:C:2001:468, para 18.

distinguishing goods or services.[408] According to the ECJ, said Article leaves it to the Member States to determine whether any other use besides use as a sign is interpreted as belonging to the scope of the exclusive right.[409] Case law of the CJEU is noticeably incoherent on the matter whether use as a sign or mere harm to the functions of the trade mark or both are required in order to afford protection against likelihood of confusion.[410] This also undermines the significance of the case law as a legal source.[411] Two different approaches have been identified in CJEU case law, namely the older approach of requiring use as a sign and more recent approach of emphasising only the harm to the functions of trade mark protection.

As an example of the older approach, in *Arsenal* the use as a sign was seen as a condition for protection under Article 10(2)(a) TMD, but which ought to be interpreted broadly. Thus, use as a badge of support could be understood as use as a sign.[412] A corresponding view was adopted in *Adam Opel*[413] and *Anheuser-Busch*[414]. On the other hand, more recent CJEU case law no longer seems to require use as a sign, and the emphasis is put on harm to the functions of the trade mark.[415] In *L'Oréal*, harm to the functions of the trade mark was presented as the main requirement for affording protection against likelihood of confusion

[408] Pihlajarinne 2010, p. 99.
[409] Judgment of the ECJ in the case C-23/01, *Robelco NV v Robeco Groep NV*, 21 November 2002, ECLI:EU:C:2002:706, paras 31–35. As an example of national trade mark legislation, e.g. the Finnish Trademarks Act requires "use as a sign of one's goods". This would imply that use as a sign is required under the Finnish Act. The Finnish Supreme Court arrived at the same conclusion in its judgment in the case KKO 2005:143, volume number 3264, 29 December 2005. See e.g. Palm 2002, p. 141.
[410] It should be noted that protection under Article 10(2)(a) TMD does not require likelihood of confusion, but it has been seen to require use as a sign. In *BMW* the ECJ drew a distinction between situations where the earlier trade mark is used as a trade mark as such, or whether it is used for other purposes. Here the use as a sign was required in order to include the act under the scope of the provision. The function of distinguishing origin was thus interpreted widely, and the judgment can be understood to expand the use of a sign to all situations where the trade mark is used in a manner describing origin of the goods, even indirectly. See Judgment of the ECJ in the case C-63/97, *Bayerische Motorenwerke AG (BMW) and BMW Nederland BV v Ronald Karel Deenik*, 23 February 1999, ECLI:EU:C:1999:82, paras 38 and 42 and Pihlajarinne 2009, p. 134 and Pihlajarinne 2010, p. 104.
[411] Pihlajarinne 2012b, p. 554.
[412] *Arsenal*, para 35. The case concerned interpretation of the current Article 10(2)(a) TMD.
[413] *Adam Opel*, para 45. In the case, the points of view related to unnecessary restrictions on competition ultimately led to the conclusion that use of a sign to refer to a scale model of a toy, not the origin of the toy itself, was not included in the exclusive right of the proprietor. Note that the case concerned interpretation of current Articles 10(2)(a) and 10(2)(c) TMD. The judgment can be interpreted in a way that use as a sign is not required for extended protection of trade marks with a reputation under Article 10(2)(c) TMD. See e.g. Pihlajarinne 2009, p. 136.
[414] *Anheuser-Busch*, paras 59–64. In the case, the ECJ held that the use of a trade name as a trade mark was required in order to afford protection, and that in case the trade mark is used in another manner than as indicator of the source of origin, the extent and nature of protection is determined by the legal order of the Member State in question.
[415] Davis et al 2014, p. 598.

under Article 10(2)(b) TMD.[416] A similar conclusion can be drawn i.a. from the judgment in *Adidas II* that the infringement of trade mark rights no longer requires use as a sign, i.e. as indicating the economic source of the goods in question.[417] Therefore, based on European case law and legal literature, use as a sign can still be seen as a requirement for affording protection in EU trade mark law at least under Articles 10(2)(a)–(b) TMD, but such use is interpreted widely and it encompasses a wide variety of different uses that can constitute use as a sign.[418] In case protection is sought in connection with other types of uses, national legislation will be decisive, whether protection is afforded or not.[419]

Another complex question in relation to likelihood of confusion is whether protection requires harm caused to one or more of the functions of trade mark protection. Likelihood of confusion arises when average consumers cannot separate the marks from one another, i.e. the economic origin of the goods or services, without effort. Consequently, the marks cannot fulfil their basic function.[420] This has been confirmed in CJEU case law, for example in the landmark case *Arsenal*, where it was found that protection should only be granted where it is necessary in order to protect the legitimate interests of the proprietor.[421] Moreover, protection should be afforded in case of harm to one of the functions of the senior mark, particularly its essential function of distinguishing based on origin.[422] It is noteworthy that only the possibility of likelihood of confusion needs to be established in order for the provisions to apply, the existence of an actual confusion does not need to be established.[423]

---

[416] *L'Oréal*, para 59.

[417] Judgment of the ECJ in the case C-102/07, *Adidas AG and Adidas Benelux BV v Marca Mode CV and Others*, 10 April 2008, ECLI:EU:C:2008:217, para 34. See also Pihlajarinne 2010, p. 126. This finding of a fundamental change in CJEU's interpretation is not without ambiguity, however, since e.g. *Yap* seems to understand the judgments differently, arguing that use indicating the economic origin of the goods is still required. Accordingly, *Badger* has argued that only the use as a sign can harm the essential function of the trade mark. See Yap 2009, p. 85 and Badger 2007, pp. 30–31.

[418] Extended protection of marks with a reputation does not require use as a sign, since all imaginable manners of using a trade mark may be detrimental to it by e.g. tarnishing or blurring. See Cornish – Llewelyn – Aplin 2013, p. 762.

[419] It should be noted that the extended protection of trade marks with a reputation under Article 10(2)(c) does not require use as a sign since its scope of protection is significantly wider.

[420] Salmi et al 2008, p. 275.

[421] *Arsenal*, para 51. It should be noted that the case concerned protection afforded by the trade mark in the case of identity between the mark and the sign and between the goods or services concerned and those for which the mark is registered.

[422] *Arsenal*, para 50. In his opinion, Advocate General Colomer also reminded the court of the fact that the functions of the trade mark extend beyond the mere indication of trade origin, since consumers are mostly unaware of the producer of the goods and trade marks acquire thus a life of their own. See opinion of Advocate General Ruiz-Jarabo Colomer in the case C-206/01, *Arsenal Football Club plc v Matthew Reed*, 13 June 2002, ECLI:EU:C:2002:373, para 46.

[423] Salmi et al 2008, p. 275.

Simon has pointed out that the essential function was used in *Canon* to widen the European trade mark law definition of infringement.[424] According to the ECJ, the essential function may be compromised not only when consumers are confused about the physical production place of the goods or services but also when consumers wrongly believe that the goods or services in question come from the same undertaking or even economically linked undertakings.[425] Furthermore, ECJ judgments in *Arsenal*, *Anheuser Busch*, *Adam Opel*, *O2 Holdings* and *L'Oréal* all seem to require harm to the functions of the trade mark in order to find likelihood of confusion.[426]

Concerning protection against double identity and likelihood of confusion, *Simon Fhima* has suggested that there is a clear indication that harm to the essential function under Article 10(2)(a) TMD amounts to a confusion standard.[427] For example in *Portakabin*, the ECJ stated that national courts must consider whether the facts of the dispute point to an adverse effect, or the risk of an adverse effect, on the function of indicating origin.[428] *O2 Holdings* connected the harm to the origin function to the requirement of likelihood of confusion.[429] The same conclusion was reached in *L'Oréal*, where it was found that use as a sign is not required, but protection could be afforded only based on harm to the functions of the trade mark, including also harm to the additional functions.[430]

Therefore, CJEU appears to be conflating protection afforded by Articles 10(2)(a) and 10(2)(b) TMD, since the question whether a junior use of a mark is reflected precisely by the scope of protection of the earlier mark is given less importance than earlier.[431] The internet context has apparently induced a wider view of likelihood of confusion, which has had implications also to the "offline" trade mark law.[432] For example as already mentioned above, in *Google France*, the ECJ found mere situations of vagueness resulting in likelihood of confusion, in case relevant consumers are left in doubt regarding the origin of the goods

[424] Simon 2005, p. 414. According to *Simon*, the case highlighted the importance of trade marks in systems of distorted competition.
[425] *Canon*, paras 28–30.
[426] See judgments of the ECJ in *Arsenal*, *Anheuser-Busch*, *Adam Opel*, *O2 Holdings* and *L'Oréal*.
[427] Simon Fhima 2014, p. 155.
[428] *Portakabin*, para 36. In *Interflora* this assessment of confusion was elaborated by the requirement of "reasonably well-informed and reasonably observant internet users" to be confused. See *Interflora*, paras 50–53 and Simon Fhima 2014, pp. 154–155.
[429] *O2 Holdings*, para 59.
[430] *L'Oréal*, para 65. Note that the *L'Oréal* case dealt with protection against identical marks under Article 10(2)(a) TMD.
[431] Simon Fhima 2014, pp. 153–154.
[432] *Ibid*, p. 155.

or services that the junior mark is referring to.[433] *Simon Fhima* has gone to the extent of arguing that a fundamental shift has gone underway in European trade mark law, and junior users would now be obliged to ensure that their actions such as advertisement will not cause consumers uncertainty about the origin of their goods or services. This interpretation is in obvious contrast with the previous standard, according to which it was for senior users to prove the existence of likelihood of confusion.[434]

Therefore, in order to render 3D printing opposable due to likelihood of confusion, the protected trade mark needs to be used as a sign in the infringing goods, i.e. as indicating the economic source of the goods or services, or harm to the functions of trade mark protection needs to be established. The requirement for use as a sign is also interpreted widely. As found above, said requirement is slightly ambiguous in relation to shape marks, but since all trade marks should be assessed by the same criteria, the requirements is valid also in connection with shapes. Due to the adaptability of digital designs in 3D printing, the requirement of use as a sign bears significance. This is justified by reasons relating to free and undistorted competition mentioned above.[435] In relation to marks with a reputation, use as a sign is not required. Therefore, the use of a shape derived from a three-dimensional trade mark with a reputation is easily opposable by the proprietor of the earlier mark.

4.4. Confusion in Connection with CAD files

Due to the flexibility of trade mark law, the legal rules can be extended to digital design files including a protected shape with no significant obstacles. Especially since the assessment of likelihood of confusion is largely based on global appreciation of all relevant circumstances, the different characteristics of the digital context can easily be taken into account.

---

[433] *Arsenal*, para 54 and *Google France*, para 90.

[434] Simon Fhima 2014, p. 156. Similarly, see Senftleben 2011, p. 63. In an attempt to create a sort of clarity to the ambiguous interpretation of the requirements for protection in connection with likelihood of confusion, *Pihlajarinne* has suggested that harm to the functions of the trade mark as a requirement for affording protection is explicit and general in connection with Article 10(2)(a) TMD. Additionally, it was suggested that protection under Articles 10(2)(b)–(c) TMD would require harm to the functions of the trade mark as set out in the provisions. In these cases, the requirement for harm would appear indirectly through the prerequisites of application of said provisions. Based on this suggestion and the requirements set out in *Interflora*, harm to the essential function should be apparent when the relevant public, i.e. technology-savvy users are confused. This systematisation would appear consistent with the suggestions of *Simon Fhima* as well. See Pihlajarinne 2010, pp. 134–135 and *Interflora*, paras 50–53. See also Simon Fhima 2014, pp. 154–155 and Subsection 4.2.2 above. As pointed out by Pihlajarinne, the only problem with this suggestion is the fact that in *Anheuser Busch*, the ECJ extended the general requirement of harm also to situations of likelihood of confusion under Article 10(2)(b). Future case law should elaborate on the inconsistency and preferably in a timely manner. See judgment of the ECJ in *Anheuser-Busch* and Pihlajarinne 2010, p. 135.

[435] See e.g. Schober 2013.

4.4.1. Grounds for Refusal or Invalidity and CAD Files

First and foremost, it should be reminded that due to the special characteristics of shape marks, a design cannot usually be registered as a three-dimensional trade mark without first having acquired distinctive character through use. However, a shape is at least in principle capable of possessing inherent distinctive character without prior use on the market.[436] In 3D printing, this can be achieved easier since shapes and designs can be altered almost endlessly and there are no considerable limits to how complex the shapes can become. The *Henkel* test requires that in order to possess sufficient distinctive character, a shape must significantly depart from the norm or customs of the sector and thereby fulfil its essential function.[437] Thus, it can be argued that 3D printing is likely to facilitate the creation of new registrable shapes with sufficient inherent distinctive character. This also means that likelihood of confusion might become more relevant already at the level of digital CAD files when designs similar to earlier registered marks are applied for three-dimensional trade mark registration. Since relative grounds for refusal or invalidity such as likelihood of confusion require action on behalf of the proprietor of the earlier mark, 3D printing and the possible increasing use of CAD files in future registrations will demand more active measures from the proprietor. When the creation of inherently distinctive shapes similar to an earlier mark is easier with 3D printing technology, the proprietor must be vigilant in protecting its three-dimensional trade marks from similar marks.

It should therefore be assessed whether likelihood of confusion can arise in the case of CAD files when applying for registration of a shape similar to a senior trade mark. In theory, in case the shape applied for possesses sufficient distinctive character and registration is not refused due to other absolute grounds of refusal or invalidity, the shape can be registered as a trade mark. Consequently, assessment of likelihood of confusion considers the senior mark and the trade mark being applied for as represented on the register and in the application. Thus, provided that CAD files will be sufficient means for trade marks to be represented in the register,[438] likelihood of confusion could arise already in connection with CAD files when a junior mark is applied for, since a physical product is not required for the registration of a three-dimensional trade mark nor for applying relative grounds for refusal

[436] See Subsection 2.5.3 above.
[437] See Subsection 2.5.2 above.
[438] This would require the implementation of the TMD in the Member States and cannot occur under the TMR since it still requires graphical representation. See Subsection 2.5.1 above.

or invalidity. However, since shapes are usually devoid of *ab initio* distinctive character, this assessment is mostly of academic interest.[439]

4.4.2. Exclusive Right of the Proprietor and CAD Files

In relation to trade mark use and the scope of the exclusive right of the proprietor, certain questions related to CAD files ought to be considered. First, the question whether a digital CAD file will be able to infringe trade mark rights due to likelihood of confusion as such will be assessed. Moreover, the question whether the mere scanning of a protected 3D trade mark may already constitute an infringing act when it results in a CAD file containing the protected shape will be assessed.[440] Different opinions have been presented in legal literature regarding the legal nature of CAD files, with some scholars considering them as artistic works, [441] while others seeing them as computer software.[442] However, in relation to trade marks, the legal nature of CAD files is of less relevance. In case likelihood of confusion arises, only the requirements for infringement set out above in Section 4.3 need to be met in order for the proprietor to be able to prohibit the use of the mark, regardless of whether the mark is materialised as a 3D printed product or depicted in a digital form. Thus, in order for a use of a CAD file depicting a shape protected by a three-dimensional trade mark to be able to be prohibited based on likelihood of confusion, the use must be in the course of trade, the shape must be used as a sign, and it must cause harm to the functions of the trade mark.[443]

A broad interpretation of use in the course of trade discussed above in Subsection 4.3.1 would imply that already 3D scanning a protected product or otherwise creating a CAD file representing the protected shape might be understood as use in the course of trade, provided that the circumstances imply commercial purpose. Since in *Google France* the ECJ found

[439] Also, representation of the shape as a CAD file is not necessarily required since graphical representations can easily be derived straight from the CAD file. Thus, even though registration is not applied based on the CAD file but a graphical representation derived from it, the same disruptive effect of 3D printing and the highly adaptable CAD files is still present in the registration phase.
[440] In the US, the matter was raised in connection with design patents, where the issue at hand was whether a CAD file of a BMW car was considered an object *per se* or instructions to print the object. See US District Court for the District of New Jersey case No. 2:16-cv-02500-SDW-LDW, BMW Group v. Turbosquid, Inc., 3 May 2016. However, the case was dismissed by the claimant and was not ruled upon.
[441] Rideout 2011, p. 168. *Rideout* has pointed out that CAD files are not computer software since they are basically "just a triangular representation of a 3D object". It should be noted that *Rideout* inspected the matter from a US copyright perspective.
[442] Mendis 2014, p. 271–276. *Mendis* concluded, after a thorough assessment, that CAD files in the European copyright context should be seen as computer software.
[443] As discussed above in Subsection 4.3.2, use as a sign is no longer required at least in certain situations.

that the lists of different types of uses in the TMD and TMR are non-exhaustive,[444] the scope of protection can easily be extended to cover emerging business models and other means of using protected shapes in the digital context and 3D printing. Thus, it is fairly safe to assume that e.g. selling CAD files including a protected design without consent from the proprietor is likely to constitute an infringing act. In such a case the use is arguably in the course of trade.

On the other hand, CAD files can be, and often are, distributed online without remuneration, which poses problems in relation to use "in the course of trade". In the US, a requirement similar to its European equivalent, namely the requirement of "use in commerce" has been interpreted widely, even to such an extent that non-sale uses can be understood as use in commerce.[445] The intention of the act and all surrounding circumstances should be considered; if the acts are committed only for personal purposes, they would not be infringing. For example offering a CAD file containing a protected shape without remuneration on an internet marketplace, where it is downloaded by multiple users, would most likely be in the course of trade. Alternatively, uploading the same CAD file without remuneration onto an online cloud service that only a handful of people can access would not be likely to amount to use in the course of trade. All in all, the requirement for use in the course of trade is crucial in determining the outer limits of trade mark protection.[446]

The requirements for use as a sign and harm to the functions of the trade mark pose additional problematic questions. Offering a CAD file for sale should include using the protected trade mark as an indication of economic origin, which could harm the functions of the trade mark. This could occur in e.g. internet marketplaces dealing with designs, such as in the example provided in the introduction, where the economic origin of the CAD files is uncertain.[447] Consumers looking for a certain brand will want to ascertain that the CAD file will be authentic and that the printed object will be of high quality.[448] For example, a designer could produce a CAD file containing the shape of the Lego figurine and offer it on sale in circumstances that result in uncertainty of the origin of the CAD file. Therefore, consumers purchasing such a CAD file could, in theory, be confused about the economic

[444] *Google France*, para 65. The same interpretation has been confirmed by the ECJ also e.g. in *Arsenal*, para 38 and *Adam Opel*, para 16.
[445] See Osborn 2014, p. 584. A similar approach could be taken in the EU, but this would require a precedent from the CJEU.
[446] Osborn 2014, p. 585.
[447] *Ibid*.
[448] Ebrahim 2016a, p. 44.

origin of the file as being either the same than the proprietor of the original Lego figurines sold in stores or another entity that is economically linked to that proprietor. For example in Germany, it has been argued that protected trademarks may already be infringed even before printing in cases where three dimensional templates, i.e. CAD files, are used. Offering a CAD file including a protected trademark can therefore constitute trademark infringement pursuant to the German Trademark Act.[449] This means that even the digital illustration of the imitation of products protected under trademark law may already be sufficient in this context.[450]

The aforementioned discussion presupposes so-called point of sale confusion, i.e. the core of likelihood of confusion scenarios.[451] Furthermore, the assessment of likelihood of confusion in relation to CAD files could be significantly different if the aforementioned doctrine of initial interest confusion was acknowledged in European trade mark law. Especially in the internet context, initial interest confusion could play a major role in CAD file trade, since consumers would easily be confused on the origin of the CAD file based on the first impression on the website, despite quickly realising their mistake, e.g. when the CAD file is subsequently inspected in more detail or the product is 3D printed based on the CAD file.[452]

On the other hand, recognising the doctrine of post-sale confusion would similarly broaden the scope of protection afforded to trade mark proprietors.[453] In relation to post-sale confusion, it would be irrelevant that the online repository or other marketplace would clearly state that the CAD file is not in any way linked to the proprietor of a similar trade mark and were for personal use only, when confusion might take place after the CAD file has been purchased, e.g. if the purchased CAD file is subsequently disseminated without the disclaimer or the purchaser of the CAD file prints the object and uses it in a manner that is likely to invoke confusion among other consumers. Post-sale confusion could prove an

[449] Act on the Protection of Trade Marks and other Symbols of 25 October 1994, as last amended by Art. 4 of the Act of 4 april 2016 (Gesetz über den Schutz von Marken und sonstigen Kennzeichen vom 25. Oktober 1994, das zuletzt durch Artikel 4 des Gesetzes vom 4. April 2016 geändert worden ist).
[450] Lehmann – Draheim 2016.
[451] See Subsection 4.1.3 above.
[452] The legal status of the US originated doctrine is still unclear in the EU. *Blythe*, for example, has suggested that initial interest confusion could be taken into account as a part of the global appreciation, or as a part of extended protection of trade marks with a reputation. See Blythe 2014 and Blythe 2016.
[453] Similarly to pre-sale confusion, the legal status of the doctrine of post-sale confusion is also ambiguous at present. See Subsection 4.1.3 above.

effective tool in combating counterfeited luxury goods,[454] which would apply similarly to counterfeiting with 3D printing technology.[455] In case initial interest confusion and post-sale confusion are accepted as actionable, as *Arsenal*, *Anheuser-Busch* and *Ruiz-Picasso* would imply,[456] the scope of likelihood of confusion cases expands significantly. An excessively broad interpretation of confusion is not, however, desirable when assessing the matter from the point of view of competitors of the proprietor as well as consumers and other third parties such as internet users.[457] A proper balance between the interests should be found and the boundaries of confusion should be elaborated with the digital context in mind.[458]

The relevance of point of sale as well as post-sale confusion could be diminished by using verification methods in relation to the design files, such as digital signatures. Such methods could be used to verify the authenticity of the origin of the CAD file and assuring that the design has not been subsequently amended.[459] This would enable the "reasonably well-informed and reasonably observant and circumspect"[460] consumers to be certain that the design file originates from the correct economic source, regardless of the distribution channel the CAD file was procured from. Another way of guaranteeing the authenticity of the CAD file is secure streaming of CAD files via an application programming interface and so-called "pay-per-print" business models. These methods enable printing of an object with a personal 3D printer without downloading the CAD file, which is sent directly to the printer.[461] Also digital rights management (DRM) has been suggested as another means of combating IPR infringement in 3D printing.[462] Bearing the shortcomings of DRM in the digital music industry, where enforcement through digital restrictions on the use of the music files backfired on the proprietors and were later largely abandoned,[463] this method of

[454] Courts in the US have employed the doctrine as means to combat counterfeiting of luxury goods. See Morris 2012, p. 47.
[455] *Hornick* has characterised 3D printers as the counterfeiter's dream machine for copying products and affixing trade marks to fake products. See Hornick 2015, p. 813.
[456] See *supra* 243.
[457] For example the US scholar *Ehrlich* has pointed out that extending confusion to post-sale situations would extend the assessment of confusion to individuals which are less careful and less sophisticated since they are not the relevant public of the goods or services but namely all consumers. This would make likelihood of confusion between the later sign and the senior mark more likely and hinder the introduction of new competing trade marks on the market. See Ehrlich 1991, p. 278.
[458] Morris 2012, pp. 46–47.
[459] Ferrill – Sirolly – Yoches 2013.
[460] *Lloyd Schuhfabrik*, para 26.
[461] See e.g. Mendis 2014, p. 281.
[462] Mendis 2013, p. 161 and from a US perspective see Ferrill – Sirolly – Yoches 2013.
[463] In the beginning of the 21st century, proprietors of digital copyright attempted to prevent online music piracy by introducing DRM systems to physical and digital copies of copyright protected works and digital

enforcing IP rights ought to be approached with caution and alternative approaches should be preferred.[464]

Based on the discussion above, 3D scanning a protected shape or a product bearing another kind of a trade mark, can in theory result in trade mark infringement, when the scan results in a CAD file bearing the trade mark. The mere act of scanning the item is not an infringement *per se*, but in case the surrounding circumstances imply that use in the course of trade and harm to the functions of trade mark protection are present, the act could be seen as an infringement. Unauthorised acts of offering or otherwise disseminating CAD files containing protected three-dimensional trade marks or signs similar to such marks are likelier to be understood as infringing acts. Therefore, it is quite clear that trade mark infringement can take place already at the level of digital design files.

music distribution. DRM systems faced severe challenges and were not accepted by consumers and the technology was largely abandoned by 2009. See Günther 2016, pp. 44–45. For a more detailed analysis on DRM, see Chinn 2016, pp. 45–47.

[464] See e.g. Mendis 2013, p. 161 and Lemley 2015, pp. 499–502. *Bradshaw et al* have noted that 3D printers restricted to printing only DRM protected CAD files would not be a very appealing alternative to open-source 3D printers, especially since they are already widely available. See Bradshaw et al 2010, p. 30.

5. DE LEGE FERENDA CONSIDERATIONS

All in all, 3D printing is unlikely to change the main process of assessment of likelihood of confusion. It might affect certain minor doctrines within the assessment such as the initial interest confusion and post-sale confusion and their adoption into European trade mark law. Therefore, some matters should be elaborated through legislative reform or case law.[465] Firstly the requirements of use as a sign and harm to the functions of trade mark protection are in need of clarification. This does not necessarily require legislative intervention, a sufficiently thorough judgment of the ECJ could suffice. From the perspective of 3D printing and other fields of industry, the situation is untenable since the requirements for likelihood of confusion are not clear and concise.[466] This adds to legal expenses as well.

Another field of trade mark law in need of clarification is the significance of the doctrines of pre-sale confusion, or initial interest confusion and post-sale confusion. Since the legal status of these subcategories of confusion is unclear, the CJEU should give out a precedent regarding the application of such doctrines in EU trade mark law and preferably in a timely manner. Alternatively, European legislature should take up action in properly defining the legal status of said doctrines. In case the alternative forms of confusion would be accepted without restrictions, the scope of protection afforded to the trade mark proprietor would expand excessively. The significance of said doctrines is also emphasised in the internet context and is thus increasing continuously. The process of global appreciation of all relevant factors that the assessment is based on enables easy adaptation to technological change due to its flexibility, but in the long run, legal certainty would require clearer rules on how the doctrine behaves in the digital context, and how the interests between IP proprietors, competitors and consumers are balanced. Another mean of safeguarding the balance between conflicting interests would be to clarify the outlines of use in the course of trade.

Furthermore, since the requirement for identical or similar goods is likely to be emphasised in the context of 3D printing as a threshold for affording protection for the trade mark proprietor, the legal rules underlying it should be revised. Currently, the threshold of "complete lack of similarity" excluding similarity of goods or services is quite high, and

[465] Dagne 2015, p. 574.
[466] Also, the legal position of initial interest confusion should be elaborated by the CJEU, since the legal status of the doctrine is unclear at the moment and the doctrine might have a significant effect on evaluation of likelihood of confusion in the digital context such as CAD files.

since the process of global appreciation of all relevant circumstances is likely to extend the scope of protection in the digital context, the threshold should be raised. Standard of proof required by the courts is also ambiguous at the moment after *Google France*. Overly decreasing the required level of proof would benefit only the trade mark proprietors at the expense of competitors.[467]

According to several scholars, the importance of IP rights such as trade marks is likely to diminish in correlation with the emerging technology of 3D printing, due to disappearance of economic scarcity.[468] In some cases, 3D printing is also likely to lessen the consumers' need for identifying the economic source of products,[469] since they will be making the product themselves; adjusting the design and choosing the material etc.[470] Furthermore, consumers will not have any reason to assume that products branded with trade marks would guarantee anything in an environment where everything is 3D printed and the quality or functionality of the product is more dependent on the configuration of the 3D printer and the raw materials used.[471] Thus, law-makers and IPR proprietors should not repeat the mistakes made in connection with digital music and copyright,[472] but acknowledge the fact that strict IP protection should not be used to create artificial scarcity where emerging technologies such as 3D printing have diminished it.[473] Doing nothing should not be an option.[474] Innovation via 3D printing technology should be facilitated and promoted with a proper balance between trade mark proprietors and other creators and users.[475] This could be achieved for example by restricting the scope of the exclusive right of trade mark protection by e.g. consolidating situations where private use takes place.[476] Another manner of achieving this could be by facilitating brand protection through trade marks by shifting

[467] A similar risk of excessively expanding the scope of protection relates to the conflation of Articles 10(2)(a) and 10(2)(b) TMD by the CJEU. Proportionate safeguards should be placed on shifting the burden of proof concerning likelihood of confusion to the junior user of a mark as in *Interflora*.
[468] Lemley 2015, pp. 470–471. Also *Grace* has expressed similar views of diminishing significance of trade mark protection in the context of 3D printing. See Grace 2014.
[469] Ebrahim 2016a, p. 37.
[470] *Lipson and Kurman* have described this as the "maker movement", where interaction between companies and user-innovators is blurring the traditional boundaries between producers, innovators and consumers. See Lipson – Kurman 2013, p. 48 and Bechtold 2016, pp. 525–526.
[471] Hornick 2015, p. 814.
[472] See *supra* 463.
[473] See Lemley 2015, pp. 504–509.
[474] Scardamaglia 2015, p. 52.
[475] *Ebrahim* suggests that the diminishing importance of IP in the 3D printing ecosystem would enable the closing of market segment adoption gaps faster. See Ebrahim 2016a, p. 7.
[476] For example, a similar non-exhaustive list found in Article 10(3) TMD and Article 9(3) TMR of uses that may be prohibited could be added to Article 10 TMD and 9 TMR. The suggested list would contain examples of uses for personal purposes, that cannot be prohibited by the proprietor.

the focus of protection from the essential function towards the protection of the emotional and symbolic appeal,[477] i.e. the additional functions of trade mark protection. Such a shift would require the reassessment of the whole trade mark system, which might appear unfeasible at present, but will be necessary in the long term.[478] Also, users' rights in 3D printing activities should be acknowledged in trade mark law in order to encourage emerging business models and the so-called "maker movement".[479] Also here the legal rules related to personal use could prove effective. By outlining much of the scope of the exclusive right, the doctrine of likelihood of confusion plays an important role in determining the said balance. Lessons should be learned from history when digital copyright piracy was combated using DRM and other restrictions on user freedom, and a more sensible approach ought to be taken. Apart from certain risks, the potential of 3D printing technology should be acknowledged. Adapting to the technology by adopting new business models should be the way forward.[480]

As another suggestion, the legal position of CAD files could be clarified. Since new business methods are developing around 3D printing and cloud manufacturing,[481] the legal status of CAD files should be elaborated since they are critical in the process of 3D printing. It is not suggested that separate elaborative provisions on 3D printing products protected by trade marks should be drafted, since this would lead to unnecessary fragmentation of the field of trade mark law. Instead, the interpretation of current legal rules should be reassessed in order to confirm that they are up to date, while maintaining technological neutrality. Remaining passive should not be an option for the European judiciary. Several aspects in relation to the assessment of likelihood of confusion need to be elaborated in a timely manner on in order to enhance legal certainty and proportionality of trade mark law. This would have a significant positive effect on the functioning and effectiveness of the internal market as well.

---

[477] From a US perspective see e.g. Bechtold 2016, p. 531 and Ebrahim 2016a, p. 37. From a EU perspective see Tarawneh 2016. *Tarawneh* has suggested a novel classification for trade mark functions as "indicators, incentives and stimulators". A clear classification of trade mark functions is necessary in order to properly define the scope of legal protection afforded by trade marks, but was regrettably not addressed by the Commission in the recent reform of the TMD and TMR.

[478] It should be noted that since the facilitation of building brands through trade marks would require shifting the emphasis from the essential function onto the additional functions such as advertising function, it would be likely to result in difficulties in registering three-dimensional trade marks. By this it is meant that i.a. shapes that give substantial value to the goods, e.g. when they are an essential part of the design and thus part of the branding, cannot be registered due to Article 4(1)(e)(iii) TMD or Article 7(1)(e)(iii) TMR.

[479] See *supra* 470.

[480] Mendis 2013, p. 168.

[481] Bechtold 2016, p. 532.

6. CONCLUSION

The protection of shapes embodies the dichotomy between the proprietor's exclusive rights and freedom of competition. Developing a product with a sufficiently distinctive shape is not always straightforward and therefore the investments of the proprietor should be protected at least to some extent. In contrast, trade mark protection of shapes can easily distort competition by perpetually preventing competitors from producing products of identical or similar shape. Three-dimensional trade marks are, in principle, assessed in the same manner as other types of trade marks. Nevertheless, some differences are inevitable due to their inherent nature. For example, a higher requirement for distinctive character in accordance with the *Henkel* test is imposed on shapes, since they are not perceived as indicators of origin similarly to other types of trade marks.

Two main scenarios of likelihood of confusion may arise in connection with three-dimensional trade marks: in connection with trade mark registration (relative grounds for refusal or invalidity) and in trade mark infringing use (the scope of the proprietor's exclusive right). Within these two main scenarios, three different forms of protection, or "heads of damage", emerge. These include the protection against identical marks in same goods or services, protection against identical or similar marks in same or similar goods or services and the extended protection of marks with a reputation. Likelihood of confusion is assumed in the first form of protection, and does not need to be established. The second form of protection is the core of likelihood of confusion assessment, where likelihood of confusion needs to be established to a sufficient extent. The third situation does not require likelihood of confusion but it is usually claimed since protection would be harder to achieve without it. Four main situations can be identified within CJEU case law and legal literature, where likelihood of confusion is likely to take place in relation to the second head of damage:

(i) likelihood direct confusion: the target group is likely to confuse a mark with another;

(ii) likelihood of indirect confusion or association: confusion concerning the economic source of the goods or services;

(iii) likelihood of association in the strict sense: the public considers the marks similar and perception of the sign calls to mind the memory of the earlier mark, although the two are not confused; and

(iv) likelihood of confusion where reasonably well-informed and reasonably observant internet users assume incorrectly that the user of a junior sign would be a part of the commercial network of the proprietor of the senior mark.

Albeit the recent extensive developments in 3D printing, the technology itself is still in its infancy when it comes to commercial exploitation. There are some special characteristics embedded in the technology and the products produced by it that also affect the legal questions arising in connection with 3D printing. The characteristics of 3D printing affect the assessment of likelihood of confusion to a certain extent. The doctrine on global assessment of all relevant factors is likely to extend to cover the new characteristics of the digital context and sale of CAD files. The circumstances in the digital context are also not necessarily connected to the exact point of sale, but the emphasis of the assessment might need widening to factors before and after the point of sale. When assessing protection against identical marks in relation to identical goods, the mere fact that a product was 3D printed might in some cases be enough to exclude the application of Article 10(2)(a) TMD or Article 9(2)(a) TMR. Then again, said protection against identical marks has recently been expanding to cover signs that are not identical but highly similar. Excessive expansion of protection afforded to trade mark proprietors under said article is not acceptable and the exact scope of protection should be clarified in case law.

In relation identical or similar marks referring to identical or similar goods, the assessment of likelihood of confusion requires consideration of all relevant circumstances. The assessment of likelihood of confusion is carried out in steps. The steps and the specific criteria that must at least be taken into account in assessing likelihood of confusion in 3D printing situations are set out as follows. First, the identity or similarity of the goods or services is determined. This step acts as a threshold requirement for finding likelihood of confusion. In case a complete lack of similarity arises in relation to the goods or services, likelihood of confusion cannot be found. In this phase of assessment, the following factors are emphasised in the context of 3D printing:

(i) price range of the goods plays an important role, since situations of likelihood of confusion are more likely to emerge in relation to more expensive goods;

(ii) materials used in the printing process and consequent characteristics of the product: the range of printable materials is relatively limited at present and the choice of material is crucial in determining the possible uses or purposes of the product; and

(iii) distribution channel and circumstances of the sale of the CAD file: emerging business models built around 3D printing lead to a variety of different distribution channels through which CAD files are procured.

Secondly, the relevant public and their respective level of attention needs to be established. At the moment, due to the novelty of the technology, the relevant public is mainly comprised of professionals, technology-savvy hobbyists and other consumers that have a special interest in the technology. This results in a higher level of attention paid by the relevant public when compared to the average consumer. Lastly, the identity or similarity of the sign used or applied for and the earlier mark is assessed. The assessment is based on global appreciation of all relevant circumstances, but the following factors should be emphasised in the context of 3D printing:

(i) quality of the print and level of sophistication of the printer: compared to expensive industrial-grade printers, consumer 3D printing usually concerns printed objects of low quality and less variation in materials and details;

(ii) level of individualisation and complexity of the product compared to other similar products on the market: in case the shape of the protected product is altered so that the dominant and distinctive parts differ, likelihood of confusion is unlikely;

(iii) origin of the CAD file and possible verification measures: in case the authenticity of the CAD file is verified, likelihood of confusion is less likely to occur; and

(iv) possible pre-sale or post-sale confusion; in relation to 3D printing, the circumstances surrounding the point of sale have an emphasised significance.

Thus in some cases, the characteristics of 3D printing technology are likely to exclude likelihood of confusion, especially in relation to individualised goods that are produced at low quantities and sold over certain digital marketplaces. The significance of likelihood of confusion in relation to trade mark registrations is also likely to increase, since the creation of new designs with ab initio distinctive character that might possess similar characteristics than existing marks is made easier by 3D printing technology and the use of CAD files. The future will show how the legal questions are answered in practice when 3D printing becomes truly an everyday phenomenon, like the basic two-dimensional printing today. Due to its characteristics and the potential it carries, 3D printing is likely to change the role of IP in the protection of products and product shapes. Adapting to 3D printing technology by adopting new business models should be pursued, since the technology involves inherent benefits that can be harnessed to promote effectiveness and innovation in several new and existing business sectors, as long as certain legal principles are respected.[482]

[482] Lehmann – Draheim 2016.