IS SOFTWARE A PRODUCT?
A comparative study of EU and US law

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Academic year: 2019-2020

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CHAPTER 1. INTRODUCTION

1. Background and problem statement

We are now living through an era of fast technological evolution and increased robotisation. Robots and AI are being used in different aspects of our lives. Examples hereof are robots that are being used in warfare, robotics in the manufacturing industry, self-driving cars and soon many more robots will be doing more and taking over a large part of human activity. In doing so, and specially due to technologies such as machine learning, robots are becoming more and more autonomous and they are now capable of making their own independent decisions.[1] The role of software may not be forgotten in this whole technological process, because robots – whether autonomous or semi-autonomous – function using software.

The above-mentioned developments and technological changes pose new challenges for the legislature and have social, moral and legal implications that need to be examined. Some authors have already begun to explore the impact of this robotisation on legal rules. The main highlight is the liability issue that arises when a robot misbehaves or causes harm or physical injury, specially in the case of misbehaviour of autonomous and machine learning robots, because usually the damage is caused due to a malfunction or defect in the software.[2]

When it comes to software, it is not easy to detect the defect or the cause of the defect because software does things that it was programmed to do, but also things that, *a priori*, it was not programmed to do and that are out of our control. For example, a software could be programmed to do only X and Y, but in fact, *a posteriori*, it does X, Y and Z.[3] When a software does Z and causes harm or physical injury, who is then liable? Even if the software does not do Z, but malfunctions, and thereby causes physical injuries, damages data and/or other physical property, such as a computer that it is run on, who is then liable?

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[1] See i.a. Ryan Calo, 'Open Robotics' (2011) 70 Maryland Law Review 101-102 available at SSRN: https://ssrn.com/abstract=1706293; Susanne Beck, 'The problem of ascribing legal responsibility in the case of robotics' (2016) AI & Soc, 473-474; John Danaher, 'Robots, law and the retribution gap' (2016) Ethics Inf Technol 299-300.

[2] See *i.a*. John Danaher, 'Robots, law and the retribution gap' (2016) Ethics Inf Technol 299-300.

[3] See Chapter 2, *infra*, for a detailed explanation on the working of software.

The applicability of the product liability laws depends on whether software can be classified as a product or not. There is no doubt that, in Europe, product liability laws can be applied when defective software is on a physical carrier, as this falls under the definition of 'product' according to the Council Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products. In this case, software is considered a component of the complete product.[4] The same can be said about the approach in the US. Therefore, the strict product liability law applies when software is on a physical carrier, because in such case it is considered a component of the complete product.[5]

The applicability of product liability laws is less clear when it comes to software *an sich*. Nowadays it is common to buy software separately and install it on a device of choice. This means that software is not always on a physical carrier because software and hardware can be delivered by different companies and software can be bought online. For example, a person who owns a Tesla, can buy software for entertainment purposes from Apple for his car, and can later buy new software from another company Z. In the hypothetical example that the car starts producing electric shocks because of the new software from company Z, it is clear that the manufacturers of Tesla are not the programmers of that software and thus, should not be held liable for the physical injury caused by the defective software. The result is that the consumer is left without remedies if the manufacturer of the car says that he did not deliver the software and thus, cannot be held liable for the physical injury, and if the programmers of the software claim that software is not a product and therefore, the product liability laws do not apply to them.

[4] Article 2 of the Council Directive 85/374/EEC on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products [1985] OJ L210 (hereafter: Product Liability Directive); See i.a. Britt Weyts, Thierry Vansweevelt, *Handboek Buitencontractueel Aansprakelijkheidsrecht* (Intersentia 2009) para 792; Loes Dommering-Van Rongen 'Productaansprakelijkheid en software' (1988) Computerr, 228; Dimitri Verhoeven, *Productaansprakelijkheid en productveiligheid* (Intersentia 2018), 50; Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 978-979; Diane Rowland 'Liability for Defective Software' (1991) Cambrian L. Rev., 79-80.

[5] Sunghyo Kim, Crashed Software: Assessing Product Liability for Software Defects in Automated Vehicles (2017-2018) Duke L. & Tech. Rev., 311-312; Lawrence B. Levy, Suzanne Y. Bell, Software Product Liability: Understanding and Minimizing the Risks (1989) High Tech. L.J., 13; Michael C. Gemignani, Product Liability and Software (1981) Rutgers Computer & Tech. L.J., 198.

It is clear from the above that, in order to apply the product liability laws and to provide consumers with remedies against harm or physical injury caused by defective software, it must be determined whether defective software *an sich* – software that is not on a physical carrier – can be classified as a product or not.

2. Study design and methodology

Although the issue of defective software has many interesting aspects, the scope of this research limits itself to a non-contractual liability perspective, specifically a product liability perspective. In particular, the issue will only be dealt with from a European and US perspective, in order to determine whether the existing product liability laws could be applied to defective software that is not on a physical carrier. Therefore, a comparative legal research that focuses on defective software that is not on a physical carrier will be conducted from a European and US product liability perspective.

The main research question is whether the existing laws on product liability, in Europe and in the US, can be applied to defective software that is not on a physical carrier.

In order to answer the main research question, three sub-questions need to be answered. The first question deals with the meaning of software, its working and its qualification from a legal point of view. The second and third question deal with the product liability laws in Europe and the US and the possibility of their application to software that is not on a physical carrier.

First of all, the existing legal framework on product liability will be analysed in Europe (CHAPTER 2), and respectively in the US (CHAPTER 3), in order to determine whether this framework can be applied to defective software that is not on a physical carrier. In the analysis, not only the existing legislation on product liability, but also case law and doctrine will be examined. Further, the technical aspect of software (regardless of the fact whether it is on a physical carrier or not), will be explained according to the existing literature on software in order to understand the concept and discuss the issues of its qualification from legal point of view to determine whether it could and/or should be considered a product (CHAPTER 4). Finally, the research will be summarised in the conclusion (CHAPTER 5).

CHAPTER 2. PRODUCT LIABILITY IN THE EU

In this chapter, the legal framework regarding product liability in Europe, specifically the Council Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products[6], will be discussed in order to determine whether and how this framework can be applied to defective software that is not on a physical carrier.

In this chapter, the Product Liability Directive will be discussed in general, followed by an explanation of the conditions of its applicability. First, the historical background and scope of application will be discussed (1), followed by an explanation of the liability regime and exceptions (2) before the damages covered by the Directive (3) and persons liable under the Product Liability Directive will be discussed (4). Further, the conditions of applicability will be dealt with separately (5), focusing on the question whether software could be considered a product and how these conditions will be understood in in case of defective software that is not on a physical carrier. Additionally, the limitation and expiration period will be discussed in order to explain what this could mean in the case of software (6). Finally, a small conclusion will provide a summary of this Chapter (7)

1. Historical background and scope of application

The development of product liability in Europe occurred much later than in the US. It was not until late in the 20th century and after the occurrence of mass product disasters in Europe that there was a movement towards product liability.[7] The drafting of the Product Liability Directive commenced in the mid-1970s but it was not until 25 July 1985 that the text was adopted.[8]

[6] Hereafter: Product Liability Directive

[7] Jean-Luc Fagnart, 'La directive du 25 juillet 1985 sur la responsabilité du fait des produits' (1987) Cahier de droit européen, 3-5; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 2.

[8] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 6.

Recital 1 provided: 'Whereas approximation of the laws of the Member States concerning the liability of the producer for damage caused by the defectiveness of his products is necessary because the existing divergences may distort competition and affect the movement of goods within the common market and entail a differing degree of protection of the consumer against damage caused by a defective product to his health or property'

Recital 2 provided: 'Whereas liability without fault on the part of the producer is the sole means of adequately solving the problem, peculiar to our age of increasing technicality, of a fair apportionment of the risks inherent in modern technological production'

It is clear from the first and second recitals that the Product Liability Directive aims at harmonising the laws of the Member States in order to guarantee the protection of the consumer, specially in a society of increasing technological advancement,[9] as well as creating a level playing field to ensure fair competition in the EU.[10] The EU product liability legislation took the form of a Directive, which is binding as to the result to be achieved, but leaves to the national authorities the choice of form and methods.[11]

The Product Liability Directive introduced a parallel liability regime to the existing national rules, but it is considered a maximal harmonisation directive.[12] It was designed to afford additional protection to consumers. Therefore, the Directive introduced a system under which there are

[9] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 15.
[10] Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 27.
[11] Reinhard Steennot, Gert Straetmans, Evelyne Terryn, Bert Keirsblick, Bert Wyseur, 'Overzicht van rechtspraak. Consumentenbescherming (2008-2014) - Marktpraktijken (2011-2014)', (2015) TPR 2015, 479; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 18.
[12] The Court of Justice has confirmed that the Product Liability Directive is a maximal harmonisation directive, see for example Case C-52/00, *Commission v France* [2002] ECR I-3827, paras. 17-20; Dirk Van De Gehuchte, *Productaansprakelijkheid in België* (Mys & Breesch Uitgevers 2000), 3.

minimum consumer rights through out the European Union.[13] Three matters were left optional within the Product Liability Directive, namely the inclusion of primary agricultural produce and game, the inclusion of the ceiling on damages and, the development risks defence. However, the exemption of primary agricultural produce and game was removed in 1999 to ensure that those infected by mad cow disease would not be excluded from compensation.[14]

2. Liability regime and exceptions

The Directive provides for a regime of strict liability, which means that liability is not based on a fault of the defendant, but solely on the fact that a defective product that has been put into circulation has caused harm.[15] This standard of strict liability is contained in Article 1 of the Directive.[16] The strict liability approach extends the liability of producers or suppliers to members of the public who were injured by the defective product without the need to prove a contractual link.[17]

However, Article 7 of the Directive states that the producer shall not be liable if he proves that he did not put the product into circulation or, that the defect which caused the damage did not exist at the time when the product was put into circulation by him or that the defect came afterwards. Nor shall he be held liable if he proves that the product was neither manufactured by him for sale or any form of distribution for economic purpose nor manufactured or distributed by him in the course of his business or, that the defect is due to compliance of the product with mandatory regulation issued by the public authorities or, that the state of scientific and technical knowledge at the time when he put the product into circulation was not such as to enable the existence of the defect to be discovered.

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[13] Andrew Turner Esq, "The EC Product Liability Directive" in Patrick Kelly and Rebecca Attree (eds.), *European Product Liability* (Butterworths 1992), 4; Sanne Pape, *Warnings and Product Liability* (Eleven International Publishing 2012), 35.

[14] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 19-22.

[15] Jean-Luc Fagnart, 'La directive du 25 juillet 1985 sur la responsabilité du fait des produits' (1987) Cahier de droit européen, 8-12; Daily Wuyts, 'Productaansprakelijkheid: een Richtlijn voor (n)iets?' (2008) TBBR, 3.

[16] William C. Hoffman and Susanne Hill-Arning, *Guide to Product Liability in Europe* (Kluwer 1994), 4; Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 978.

[17] Andrew Turner Esq, "The EC Product Liability Directive" in Patrick Kelly and Rebecca Attree (eds.), *European Product Liability* (Butterworths 1992), 5.

Also if he proves, in case of a manufacturer of a component, that the defect is attributable to the design of the product in which the component has been fitted or to the instructions given by the manufacturer of the product.[18]

3. Damages covered by the Product Liability Directive

In order to claim damages, the injured person shall be required to prove the damage, the defect and the causal relationship between defect and damage[19], but not all kinds of damages are regulated or covered by the Product Liability Directive. Article 9 lists the damages that are regulated by the Directive.[20] It regulates the liability for death or personal injury and damage to or destruction of property, other than the defective product itself provided that the damage is more than 500 euro[21], that the item of property is intended for private use or consumption and mainly used as such by the injured party. Damage to the product itself, for lost profits or other economic losses are not covered by the Directive.[22] Article 9(b) explicitly states that damage to the product itself is kept outside the scope of the Directive.[23]

The Product Liability Directive applies to the liability for damage caused by movables, irrespective of whether the product is distributed as a separate, finished product or as raw material to be processed or as a component part to be incorporated into another movable or immovable.[24] The Court of Justice ruled that it does not matter whether the product is distributed by way of sale, hire,

[18] Article 7.

[19] Article 4; Jean-Luc Fagnart, 'La directive du 25 juillet 1985 sur la responsabilité du fait des produits' (1987) Cahier de droit européen, 19; K. Alheit 'The Applicability of the EU Product Liability Directive to Software' (2001) Comp. & Int'l LJ, 195.

[20] Jean-Luc Fagnart, 'La directive du 25 juillet 1985 sur la responsabilité du fait des produits' (1987) Cahier de droit européen, 20.

[21] The threshold was introduced in order to avoid excessive litigation, see Recital 9. See also K. Alheit 'The Applicability of the EU Product Liability Directive to Software' (2001) Comp. & Int'l LJ, 196.

[22] William C. Hoffman and Susanne Hill-Arning, *Guide to Product Liability in Europe* (Kluwer 1994), 4.

[23] Article 9; See also Recital 9 of the preambule of the Product Liability Directive.

[24] Article 2; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 32; Daily Wuyts, 'Productaansprakelijkheid: een Richtlijn voor (n)iets?' (2008) TBBR, 10.

leasing or in the course of providing a service.[25] However, services as such fall outside the scope of the Directive.[26]

National law of the Member States must provide full and proper compensation for the types of damages that are covered by the Directive, but it is left to the national law to determine the precise content of the compensation. Compensation for non-material damage as a consequence of death or personal injury is also governed by the national law. However, financial loss resulting from personal injury or from material damage to or loss of property falls within the scope of the Directive. [27]

4. Persons liable under the Product Liability Directive

The Product Liability Directive introduces strict liability for producers of a product containing a defect that causes personal injury or property damage.[28] Article 3 defines a producer as the manufacturer of a finished product, the producer of any raw material or the manufacturer of a component part and any person who, by putting his name, trade mark or other distinguishing feature on the product presents himself as its producer.[29] Article 3 also states that any person who imports a product into the European Union for sale, hire, leasing or any form of distribution in the course of his business shall be deemed to be a producer within the meaning of the Directive and shall be responsible as a producer.[30] In case the producer cannot be identified, each supplier of the product shall be treated as its producer unless he informs the injured person of the identity of the producer

[25] Case C-203/99 *Veedfald v Århus Amstkommune* [2001] ECR I-3569, para. 12; Daily Wuyts, 'Productaansprakelijkheid: een Richtlijn voor (n)iets?' (2008) TBBR, 10; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 33.

[26] Michel Flamée, 'Productaansprakelijkheid voor software' (1990) De Verz., 656; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 62.

[27] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 34-35.

[28] William C. Hoffman and Susanne Hill-Arning, *Guide to Product Liability in Europe* (Kluwer 1994), 3.

[29] Article 3(1).

[30] Article 3(2).

or the person who supplied him with the product. The same applies in case of an imported product and the product does not indicate the identity of the importer.[31]

5. Conditions of applicability of the Product Liability Directive

5.1. Product

5.1.1. Meaning of product under the Product Liability Directive

The Product Liability Directive is applicable when the damage was caused by a defective product.[32] This brings us to the definition of a product. Article 2 defines products as all movables, even if they are incorporated into another movable or into an immovable.[33] It follows from this broad definition that the Product Liability Directive applies to a very wide range of products.[34]

The Directive is only applicable to movable goods. Immovable goods are excluded because they are governed by specific rules in the Member States. However, the exclusion of immovable goods has been criticised by several scholars who argue that it is not consistent with the idea of harmonising product liability legislation in the EU.[35] Movable goods that are incorporated into an immovable good fall within the scope of the Product Liability Directive, for example bricks and windows that are used to build a house. The Directive is also applicable to movable goods that are incorporated into another movable good, for example the components of a car.[36]

Some authors argue that the Directive only applies to tangible goods[37], even though the Directive does not explicitly exclude intangible goods. This argument is based on the fact that electricity,

[31] Article 3(3).
[32] Article 1.
[33] Article 2.
[34] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 53.
[35] See for example: Dirk Van De Gehuchte, *Productaansprakelijkheid in België* (Mys & Breesch Uitgevers 2000), 34.
[36] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 54-55; Dirk Van De Gehuchte, *Productaansprakelijkheid in België* (Mys & Breesch Uitgevers 2000), 34-35.
[37] See for example Jean-Luc Fagnart, 'La directive du 25 juillet 1985 sur la responsabilité du fait des produits' (1987) Cahier de droit européen, 31.

which is a non-perceptible good and which would otherwise fall outside the scope of the Directive, is explicitly included in Article 2.[38] They argue that there would be no need to include electricity explicitly if the Directive applied to intangible goods and therefore, it must be assumed that the Directive only applies to tangible goods.[39] Other scholars argue that the explicit inclusion of electricity is proof of the broad definition, so that the Directive is applicable to other intangible goods that are not mentioned in the Directive, for example software.[40]

Article 2 of the Product Liability Directive makes no distinction between the production methods of goods, nor does the explanatory memorandum to the original proposal of the Directive. Therefore, the Directive applies to all kinds of products, whether industrially produced or not. Furthermore, the European Commission answered a parliamentary question on whether craft and artistic goods fall within the scope of the Directive in the affirmative. The Court of Justice confirmed this view in the *Henning Veedfald* case by applying the Directive to a non-industrially produced good.[41]

Over the years, the broad scope of application of the Product Liability Directive has been demonstrated because several products with special characteristics have been found to be falling within the scope of the Directive. Examples of these products are water and gas, and human body

[38] See also K. Alheit 'The Applicability of the EU Product Liability Directive to Software' (2001) Comp. & Int'l LJ, 200.

[39] Thierry Vansweevelt and Britt Weyts, *Handboek buitencontractueel aansprakelijkheidsrecht* (Intersentia 2009), 503; Daily Wuyts, 'Productaansprakelijkheid: een Richtlijn voor (n)iets?' (2008) TBBR, 8; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 56; Dimitri Verhoeven, *Productaansprakelijkheid en productveiligheid* (Intersentia 2018), 42.

[40] Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 28; Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 56; Hubert Bocken, Ingrid Boone & Marc Kruithof, *Inleiding tot het schadevergoedingsrecht* (Die Keure 2014), 317; David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 816; Diane Rowland 'Liability for Defective Software' (1991) Cambrian L. Rev., 83; Michel Flamée, 'Productaansprakelijkheid voor software' (1990) De Verz., 661.

[41] Daily Wuyts, 'Productaansprakelijkheid: een Richtlijn voor (n)iets?' (2008) TBBR, 9; Dirk Van De Gehuchte, *Productaansprakelijkheid in België* (Mys & Breesch Uitgevers 2000), 34; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 60-61; Question No 706/55 [1989] OJ C114/42; Case C-203/99 *Veedfald v Århus Amtskommune* [2001] ECR I-3569.

parts.[42] Piped water and gas are products and fall within the scope of the Product Liability Directive because these are energy sources that can be perceived by our senses and must be considered movable and tangible goods.[43] The classification of human body parts is more difficult, but it can generally be assumed that parts of the body, such as blood and tissues, are movable and tangible goods. Therefore, these are products within the meaning of the Directive. However, only when bodily material has been removed from the human body can it be considered a product, but it remains a product even after it becomes part of another human body. This can be illustrated in a number of national blood cases.[44]

5.1.2. Software

The Product Liability Directive does not mention software. The reason why is probably the fact that the Directive dates from a time where software was not as prominent in our lives as it is today. This also clarifies why the European Commission made clear that software on a physical carrier is a product, in a time when software was not bought online.[45]

The law doctrine is divided on the subject of software. Some legal scholars argue that we cannot speak of a product because software is a service, others say that it is an intangible good to which the Product Liability Directive is not applicable, unless it is on a physical carrier.[46]

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[42] Jean-Luc Fagnart, 'La directive du 25 juillet 1985 sur la responsabilité du fait des produits' (1987) Cahier de droit européen, 30; Dirk Van De Gehuchte, *Productaansprakelijkheid in België* (Mys & Breesch Uitgevers 2000), 36; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 65.

[43] Dirk Van De Gehuchte, *Productaansprakelijkheid in België* (Mys & Breesch Uitgevers 2000), 36; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 65.

[44] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 65-66; See *inter alia* Court Amsterdam, 3 February 1999, NJ 1999, 621; *A v Nationa Blood Authority* [2001] 3 AII ER 289; Court of Appeal Brussels, 10 February 2005, T Gez 2007-08, 284.

[45] Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 30; Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 56.

[46] See *supra;* See also *infra* Chapter 4.

With regard to the intangibility, two arguments could be thought of as a defence. First, the Product Liability Directive does not explicitly exclude intangible products and although the tangibility of software cannot be seen in the software itself, because it is a collection of data and information, it can be seen in its functioning namely in carrying out the tasks it was programmed to do. Second, there is always a physical carrier in the case of software where the instructions and algorithms are saved. These exist because they are saved somewhere, for example on a server or a computer, otherwise they would get lost and become non-existent. Therefore, it can be said that there is a physical carrier that makes the software tangible and its tangibility can be seen in its functioning.[47]

Although one might argue that the server is not a mass-produced product that is put into circulation on the market in the traditional ways, this is not a precondition for the applicability of the Product Liability Directive and the argument should therefore be set aside.[48] In this regard, it should be noted that the expression 'put into circulation' is not defined by the Directive[49] but is clarified by the Court of Justice.[50] In its judgment in the *O'Byrne* case, the Court of Justice clarified that "…a product must be considered as having been put into circulation, within the meaning of Article 11 of the Directive, when it leaves the production process operated by the producer and enters a marketing process in the form in which it is offered to the public in order to be used or consumed."[51]. It follows from the wording of Article 11 and the case law of the Court of Justice that there are no specific conditions on how a product should be put into circulation and that what matters is that the production process has been finished and that the product has entered a marketing process. Therefore, the expression 'put into circulation' must be interpreted broadly and in accordance with the purpose and aim of the Directive.[52]

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[47] Loes Dommering-Van Rongen 'Productaansprakelijkheid en software' (1988) Computerr., 229; Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 26.

[48] See *supra*; see also Loes Dommering-Van Rongen 'Productaansprakelijkheid en software' (1988) Computerr., 229; Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 26.

[49] Jean-Luc Fagnart, 'La directive du 25 juillet 1985 sur la responsabilité du fait des produits' (1987) Cahier de droit européen, 74.

[50] Daily Wuyts, 'Productaansprakelijkheid: een Richtlijn voor (n)iets?' (2008) TBBR, 40-41.

[51] Case C-127/04 *Declan O'Byrne v Sanofi Patseur MSD Ltd and Sanofi Pasteur SA* [2006] ECLI:EU:C:2006:93, para 27.

[52] Reinhard Steennot, Gert Straetmans, Evelyne Terryn, Bert Keirsblick, Bert Wyseur, 'Overzicht van rechtspraak. Consumentenbescherming (2008-2014) - Marktpraktijken (2011-2014)', (2015) TPR 2015, 486; See also Loes Dommering-Van Rongen 'Productaansprakelijkheid en software' (1988) Computerr., 229; Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 26; Duncan Fairgrieve, Geraint Howells, Peter

In addition, an extensive interpretation of the scope of applicability of the Directive is in line with the interpretation principle developed by the Court of Justice. In the absence of an express definition in the Directive itself, concepts have to be interpreted in accordance with the purpose and the aim pursued by the Directive.[53] A broad interpretation contributes to the level of consumer protection the Directive was intended to introduce in the Member States. In other words, excluding software would then be at odds with the aim of the Directive, namely protection of the consumers.[54]

The Court of Justice has not been asked to rule on whether software is a product or not yet, but based on one of its relatively recent cases, namely the *UsedSoft v Oracle* case[55], that could be seen as an indication, it will probably decide that it should be considered a product. The reference was made in proceedings between UsedSoft and Oracle concerning the marketing of used licenses for Oracle computer programs by UsedSoft and the case concerned exhaustion of distribution rights, as laid down in Article 4(2) of Directive 2001/29/EC of the European Parliament and of the Council of 23 April 2009 on the legal protection of computer programs. In the *UsedSoft v Oracle* case, the Court of Justice ruled in 2012 the that downloaded software should be seen as a replacement of the physical copy that is provided by other means, such as a CD-ROM or a DVD. In other words, the Court ruled that downloading can be seen as an analogue way of distribution by applying Article 4(2) of Directive 2009/24 to both tangible and intangible copies.[56] Although this case was not a product liability case, it could be seen as an indication that the Court of Justice is moving towards a teleological interpretation by viewing downloaded software as a product. However, this point of view still needs to be confirmed by the Court of Justice and until a question is referred to the Court

Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 144.

[53] Case C-203/99 *Veedfald v Århus Amtskommune* [2001] ECR I-3569, recital 14; Michel Flamée, 'Productaansprakelijkheid voor software' (1990) De Verz., 655-656.

[54] This reasoning is made by analogy, based upon the analysis why 'pure information' should be considered a product in Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 73-76; Michel Flamée, 'Productaansprakelijkheid voor software' (1990) De Verz., 656.

[55] Case C-128/11 *UsedSoft GmbH v Oracle International Corp.* [2012] ECLI:EU:C:2012:407.

[56] Case C-128/11 *UsedSoft GmbH v Oracle International Corp.* [2012] ECLI:EU:C:2012:407, paras. 57-59.

of Justice, it is not certain whether national courts, if faced with the issue, will rule that software (that is not on a physical carrier) is a product.

5.2. Defectiveness

The central concept of defectiveness is the standard of liability which is set forth in the Product Liability Directive, without negligence or fault of the producer or the supplier being required. According to Article 6 of the Directive, a product is defective when it does not provide the safety which a person is entitled to except, taking all circumstances into account.[57] The Directive mentions a non-exhaustive list of three specific circumstances: the presentation of the product, the use to which it could reasonably be expected that the product would be put and the time when the product was put into circulation.[58] Paragraph 2 of the same article states that a product shall not be considered defective for the sole reason that a better product is subsequently put into circulation.[59]

It follows from Article 6 that the only thing that matters for product liability is the safety of the product. The defectiveness of the product should not be determined by reference to its fitness for use. Whether a product is fit for its intended purpose is a matter that is governed by national rules. For example, a kitchen knife that cannot cut properly indicates that it is not fit for its intended use, but this does not automatically mean that it is a defective product within the meaning of the Product Liability Directive.[60] Moreover, the fact that a product is dangerous does not make it defective. For example, the fact that a sharp kitchen knife is dangerous does not make it a defective product in the

[57] See also K. Alheit 'The Applicability of the EU Product Liability Directive to Software' (2001) Comp. & Int'l LJ, 196.

[58] See also Reinhard Steennot, Gert Straetmans, Evelyne Terryn, Bert Keirsblick, Bert Wyseur, 'Overzicht van rechtspraak. Consumentenbescherming (2008-2014) - Marktpraktijken (2011-2014)', (2015) TPR 2015, 486.

[59] Article 6; Daily Wuyts, 'Productaansprakelijkheid: een Richtlijn voor (n)iets?' (2008) TBBR, 11; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 77.

[60] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 78.

sense of Article 6. A dangerous product only becomes defective when it does not provide the safety which a person is entitled to except.[61]

Article 6 states that the defectiveness must be assessed on the basis of what a normal person is entitled to expect. This means that there is only one criterion that determines whether a product is defective or not.[62] Defectiveness is in principle determined only on the basis of the average consumer expectation test rather than a risk-utility test. However, it should be noted that the wording of Article 6 is not accurate since the test should be objective and independent of the interests of consumers and producers. Therefore, the Directive sets an objective and normative criterion to determine defectiveness of a product.[63]

The criterion is objective because the defectiveness must be assessed, *in abstracto*, on the basis of the legitimate expectations of the public and thus not on the subjective expectations of someone. The standard is the safety which the general public is entitled to expect.[64] However, if the product is aimed at a specific group of users and this group is known to the producer, the assessment of the safety of the product has to be carried out according to the objective expectations and perceptions of the member of that specific group (see *infra*).[65]

It is not possible to determine the standard of safety that the whole range of consumers is entitled to expect for all products. Therefore, the assessment must be done on a case-by-case basis, taking into

[61] Reinhard Steennot, Gert Straetmans, Evelyne Terryn, Bert Keirsblick, Bert Wyseur, 'Overzicht van rechtspraak. Consumentenbescherming (2008-2014) - Marktpraktijken (2011-2014)', (2015) TPR 2015, 486.

[62] Jean-Luc Fagnart, 'La directive du 25 juillet 1985 sur la responsabilité du fait des produits' (1987) Cahier de droit européen, 43.

[63] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 79.

[64] Jean-Luc Fagnart, 'La directive du 25 juillet 1985 sur la responsabilité du fait des produits' (1987) Cahier de droit européen, 49; Daily Wuyts, 'Productaansprakelijkheid: een Richtlijn voor (n)iets?' (2008) TBBR, 11.

[65] Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 59; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 80.

account all the relevant circumstances. This is not an easy task, but the courts usually have a wide margin of appreciation when doing the product safety assessment.[66]

The criterion is not only objective, but also normative because it takes the legitimate expectations of the general public as a basis for the assessment.[67] This means that the courts will establish the level of safety the public is entitled to expect regardless of the actual expectations, the safety standards applicable in practice and the standards promulgated by the governments. The normative character of the test prevents the public from having unrealistic expectations, but allows the public to expect more in some circumstances.[68]

However, it follows from the case law of the Court of Justice that courts can take into consideration the expectations of a specific group to whom the product is aimed.[69] The Court of Justice confirmed this in the *Boston Scientific* case.[70] When the Court answered the referred preliminary question[71] regarding the assessment of potential defect in pacemakers and cardioverter defibrillators where it had been established that a component of these products is defective, it first recalled that the assessment of the defectiveness of a product must be carried out having regard to the reasonable expectation of the public at large. The Court then continued that the safety that the public is entitled to expect must be assessed by taking into account, *inter alia*, the intended purpose, the objective

[66] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 80.

[67] Jean-Luc Fagnart, 'La directive du 25 juillet 1985 sur la responsabilité du fait des produits' (1987) Cahier de droit européen, 50; Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 59.

[68] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 81.

[69] Reinhard Steennot, Gert Straetmans, Evelyne Terryn, Bert Keirsblick, Bert Wyseur, 'Overzicht van rechtspraak. Consumentenbescherming (2008-2014) - Marktpraktijken (2011-2014)', (2015) TPR 2015, 489.

[70] Joined Cases C-503/13 and C-504/13 *Boston Scientific Medizintechnik v AOK Schsen-Anhalt* [2015] ECLI:EU:C:2015:148

[71] The first question dealt with whether the potential defect in the pacemakers and cardioverter defibrillators could make all the product defective (Joined Cases C-503/13 and C-504/13 *Boston Scientific Medizintechnik v AOK Schsen-Anhalt* [2015] ECLI:EU:C:2015:148, para 36) and the second question was whether the damage caused by the surgical replacement of such defective products could be considered 'damage caused by death or personal injuries' for which the producer is liable (Joined Cases C-503/13 and C-504/13 *Boston Scientific Medizintechnik v AOK Schsen-Anhalt* [2015] ECLI:EU:C:2015:148, para 44.).

characteristics and properties of the product in question and the specific requirements of the group of users for whom the product is intended. With regard to the pacemakers and cardioverter defibrillators, the Court of Justice emphasised that, *in casu*, the patients using such devices are entitled to have high expectations. Hence, the Court of Justice had no difficulty in finding that it is possible to classify all the products of that group as defective, without there being any need to show that the product in question is defective.[72] With this judgment the Court of Justice emphasises that the assessment of defectiveness must be done having regard only to safety, which can exist irrespective of any internal fault in the product concerned, the high level of consumer protection granted by the Product Liability Directive and the preventive function of the Directive.[73]

5.2.1. Assessment of the defectiveness

There are circumstances that must to be taken into account when assessing the legitimate safety expectations of the general public. Article 6 of the Directive contains a non-exhaustive list of three elements. This allows for courts to take other elements into account, such as the type of the product. Article 6 mentions (A) the presentation of the product, (B) the reasonable expected use of a product, and (C) the time when the product was put into circulation.[74] These three elements will be discussed separately below.

(A) The presentation of the product

How a product is presented has influence on the safety expectations of the general public. The presentation of a product must be interpreted broadly. Presentation includes marketing, advertisement, packaging, instructions, warnings, etc. Information describing the (risks of the)

[72] Joined Cases C-503/13 and C-504/13 *Boston Scientific Medizintechnik v AOK Schsen-Anhalt* [2015] ECLI:EU:C:2015:148; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 83-88.

[73] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 89-90.

[74] Jean-Luc Fagnart, 'La directive du 25 juillet 1985 sur la responsabilité du fait des produits' (1987) Cahier de droit européen, 51; Reinhard Steennot, Gert Straetmans, Evelyne Terryn, Bert Keirsblick, Bert Wyseur, 'Overzicht van rechtspraak. Consumentenbescherming (2008-2014) - Marktpraktijken (2011-2014)', (2015) TPR 2015, 486.

product is important and will also be taken into account when assessing the safety of the product.[75] Moreover, it is generally accepted that inaccurate, incomplete or missing information renders a product defective.[76] Thus, it follows that the producer must provide accurate and complete information on the use of the product and the possible risks linked to (the use of) that product.[77]

Whether a defective product can become a safe product by giving the correct information about its use and risks is uncertain. This will depend on whether the court rules that the product meets the legitimate safety expectations. This could mean that the more information is provided to the public, the lower the safety expectation they may be expected to have.[78] It is not possible to warn the public about all the potential risks or dangers of a product, but it is generally accepted that providing accurate information and warnings do not make a product safe if the product itself is unsafe and does not meet the safety expectations of the general public.[79]

(B) The reasonable expected use of the product

With regard to the use of a product, not only the normal use of a product, but also the reasonably expectable use of a product is taken into consideration.[80] This means that the producer has to anticipate the reasonable expected conduct of the user which is not limited to consumption, but includes activities such as storage, cleaning, inspection and repair. Moreover, the user benefits from a certain margin of reasonable misuse because the reasonable expected use is not restricted to the

[75] See for example a Belgian case: Luik 25 October 2011 (2013) T. Verz., 100. The injured person in *casu* did not respect the manual and disregarded the warnings that were provided by the producer.

[76] See for example a Belgian case: Luik 17 January 2013 (2014) Rbdcml, 81 (case note Catherine Delforge)

[77] Thierry Vansweevelt and Britt Weyts, *Handboek buitencontractueel aansprakelijkheidsrecht* (Intersentia 2009), 512; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 92-93.

[78] Reinhard Steennot, Gert Straetmans, Evelyne Terryn, Bert Keirsblick, Bert Wyseur, 'Overzicht van rechtspraak. Consumentenbescherming (2008-2014) - Marktpraktijken (2011-2014)', (2015) TPR 2015, 487.

[79] Dimitri Verhoeven, 'Het redelijkerwijs voorzienbaar gebruik van een product en het later ontstaan van gebreken in de wet productaansprakelijkheid (case note under Antwerp 28 October 2009)' (2011) TBBR, 390; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 94-96.

[80] Reinhard Steennot, Gert Straetmans, Evelyne Terryn, Bert Keirsblick, Bert Wyseur, 'Overzicht van rechtspraak. Consumentenbescherming (2008-2014) - Marktpraktijken (2011-2014)', (2015) TPR 2015, 488.

modal or anticipated destination of the product. This means that some careless use of the product must be tolerated.[81]

It follows from the above that the producer cannot expect the user to always use the product in the normal way or in the way the producer intended the product to be used.[82] To anticipate this conduct, the producer must design and produce the product in a safe way and by effectively warning the consumer. This means that the producers must ensure that the product provides adequate safety even in the event of a reasonably foreseeable misuse of the product. A classic example is the producer of toys for young children and infants, who has to anticipate that they will put the toys in their mouth although such conduct is not the normal use of the toys.[83]

When assessing the defectiveness, specifically a wrong conduct or use of the product, we distinguish between reasonable misuse and unreasonable abuse of the product. It is important that the use of the product does not constitute unreasonable abuse. In such case, the Product Liability Directive will not be applicable[84] because the producer does not have to anticipate the unreasonable abuse of the product. A producer can sometimes warn users about certain abuses of the product, but it will only lead to unreasonable abuse if the user disregards the warnings. This means that a product cannot be considered defective if the user did not respect the warnings and made unreasonable abuse of the product.[85]

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[81] Dimitri Verhoeven, 'Het redelijkerwijs voorzienbaar gebruik van een product en het later ontstaan van gebreken in de wet productaansprakelijkheid (case note under Antwerp 28 October 2009)' (2011) TBBR, 391; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 98.

[82] Daily Wuyts, 'Productaansprakelijkheid: een Richtlijn voor (n)iets?' (2008) TBBR, 16.

[83] Reinhard Steennot, Gert Straetmans, Evelyne Terryn, Bert Keirsblick, Bert Wyseur, 'Overzicht van rechtspraak. Consumentenbescherming (2008-2014) - Marktpraktijken (2011-2014)', (2015) TPR 2015, 488; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 99; Dimitri Verhoeven, 'Het redelijkerwijs voorzienbaar gebruik van een product en het later ontstaan van gebreken in de wet productaansprakelijkheid (case note under Antwerp 28 October 2009)' (2011) TBBR, 391.

[84] See Recital 6 of the Product Liability Directive; see also Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 38.

[85] Britt Weyts, Thierry Vansweevelt, *Handboek Buitencontractueel Aansprakelijkheidsrecht* (Intersentia 2009) 516; Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr

(C) The time when the product was put into circulation

The legitimate safety expectations at the time when the product was put into circulation are also taken into account. It follows that all the elements of the safety assessment must be assessed according to the time when the product was put into circulation. The safety assessment is done using to the pertaining technical standards, regulatory standards and safety legislation at the time when the product was put into circulation.[86]

5.2.2. Software defectiveness assessment

How defectiveness will be assessed in the case of software is not an easy question. Software products are numerous and complicated and it is not easy for the general public to understand how they function. Therefore, it is not easy to determine the legitimate expectations of the general public. In order for accurate expectations of a specific product to be determined, people need to become familiar with that product and because of the continuous innovation and technological development, it is not possible to compare some products with a realistic standard. Although it is not easy to determine the legitimate expectations of the general public, it is not an impossible task.[87]

First, the presentation of a product can influence the legitimate expectations. Providing accurate and complete information on the use and functioning of a software, as well as warnings, play an important role in determining the expectations of the general public. This means that producers should be careful when providing information about software so that it does not lead to unrealistic expectations of the general public.[88]

Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 100-101.

[86] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 102.

[87] Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 981; See also Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 33.

[88] Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 981.

Second, the legitimate expectations are assessed according to the reasonable expected use of a product. The reasonable expected use of a software would be using it with compatible devices, but it is not unthinkable that people might try to download it or install it on incompatible devices. In that case, it is difficult to know the consequences of such conduct because technology faces some shortcomings.[89]

Third, the legitimate expectations are assessed according to the time when the product was put into circulation. The injured person only has to prove that the product is defective, but the producer will not be held liable if he proves that the defect did not exist at the time when the product was put into circulation. As mentioned above, the expression 'put into circulation' is interpreted broadly (see *supra*) so that the sale of software can fall under the expression, regardless of the way it was put on the market. The same could be argued for an update of a software because it replaces the past version and becomes the new product,[90] regardless of the way it is put on the market.[91] However, the situation could be different when we are dealing with a machine learning software that constantly teaches itself new things. In the case of machine learning software, there is no update of the software or a new product because the producer does not have to undertake any additional actions, which means there is no new production or marketing process.[92]

Machine learning is a process through which data is gathered and analysed in order to improve the (speed of the) decision making process of software.[93] A machine learning software may not be considered defective based on the sole fact that it can teach itself new things. Moreover, this would be the legitimate expectation of the general public since machine learning software would be expected to result in improving the (speed of the) decision making process. However, it is not

[89] Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 981-982.

[90] However, the mere fact that there is an update or a newer version does not make the previous one defective, meaning that the injured person still needs to prove that the previous version was defective. See K. Alheit 'The Applicability of the EU Product Liability Directive to Software' (2001) Comp. & Int'l LJ, 203.

[91] Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 982.

[92] Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 18; Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 982.

[93] Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 982.

impossible that machine learning results in a worse decision making process or that there is a defect or malfunction of the software. This would mean that the software was not programmed properly. Therefore, if a defect or malfunction occurs that results in damage, then this means that the defect existed from the moment when the software was put into circulation. In other words, if the software could teach itself a defect from the moment when it was put into circulation, then this makes it a defective product.[94]

6. Limitation and expiry period

The liability for defective products does not last for an unlimited period of time. The Product Liability Directive provides for a limitation period of the liability of the producer. Article 10 states that Member States shall provide in their legislation that a limitation period of three years shall apply to proceedings for the recovery of damages as provided for in the Directive. The limitation period shall begin to run from the day on which the plaintiff became aware, or should reasonably have become aware, of the damage, the defect and the identity of the producer.[95] In other words, once the injured person obtains the information required for starting the proceedings, the limitation period of three years begins to run. A limitation period of three years was chosen because in order to give the injured person enough time in case he or she has to start proceedings against a producer from another country.[96]

Apart from the limitation period, the Product Liability Directive provides for an expiration period of ten years. Article 11 states that Member States shall provide that, unless the injured person has started proceedings against the producer,[97] the rights of the injured person shall be extinguished upon the expiry of a period of ten years from the date on which the producer put the product into circulation.[98] Given the natural wear and tear, the technological developments and the increasingly

[94] Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 81.
[95] Article 10; Reinhard Steennot, Gert Straetmans, Evelyne Terryn, Bert Keirsblick, Bert Wyseur, 'Overzicht van rechtspraak. Consumentenbescherming (2008-2014) - Marktpraktijken (2011-2014)', (2015) TPR 2015, 500.
[96] Daily Wuyts, 'Productaansprakelijkheid: een Richtlijn voor (n)iets?' (2008) TBBR, 49.
[97] Case C-358/08 *Aventis Pasteur SA v OB* [2009] ECLI:EU:C:2009:744; Reinhard Steennot, Gert Straetmans, Evelyne Terryn, Bert Keirsblick, Bert Wyseur, 'Overzicht van rechtspraak. Consumentenbescherming (2008-2014) - Marktpraktijken (2011-2014)', (2015) TPR 2015, 499.
[98] Article 11.

strict safety standards that are imposed on new products, it is only fair to set an expiration period. Added to that the fact that, over time, it becomes more difficult to determine whether the defect existed at the time when the product was put into circulation. Therefore, an expiration period of ten years was chosen to guarantee consumer protection without imposing a heavy burden on the producers.[99]

Applied to software, in particular to an update thereof, the limitation and expiration period should start to run if a new update replaces the software because an update is a new product. In other words, a new limitation period of three years and an expiration period of ten years should start to run with every new update.[100] However, if a software – whether self learning or not – that has never been updated causes damage after ten years, then the Product Liability Directive will not apply because the rights of the injured person will have extinguished by then. Therefore, the expiration period which is contained in the Directive would not suffice for these products and might need some revisions because it could result in preventing an injured person from starting proceedings against a producer who put a defective product into circulation.[101]

7. Conclusion

The Product Liability Directive, which is a maximal harmonisation directive, introduced a regime of strict liability for producers of defective products. The Directive was designed to guarantee minimum consumer rights throughout the European Union.

Whether software is a product is not determined by the Product Liability Directive, nor in the case law of the Court of Justice. Nevertheless, software should be considered a product to which the Directive is applicable. An extensive interpretation of the scope of applicability of the Directive is in line with the interpretation principles developed by the Court of Justice. Moreover, broad interpretation contributes to the level of consumer protection the Directive was intended to introduce in the Member States.

[99] Daily Wuyts, 'Productaansprakelijkheid: een Richtlijn voor (n)iets?' (2008) TBBR, 50.
[100] See by analogy: Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 82.
[101] See by analogy: Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 18

When assessing the defectiveness of software, the legitimate expectations of the general public are what matters for the assessment. Once people become more familiar with the different types of software and their functioning, they will be able to form reasonable legitimate expectations on the safety of such products.

Finally, the time when a product is put into circulation is important to determine the defectiveness, but also the expiration period of the liability of the producer. Applied to software, specifically to an update thereof, a new limitation and expiration period should start to run if a new update replaces the software since an update is a new product.

CHAPTER 3. PRODUCT LIABILITY IN THE US

In this chapter, the legal framework regarding product liability in the US, specifically the *Restatement (Third) of Torts: Products Liability,* will be discussed in order to determine whether and how this framework can be applied to defective software that is not on a physical carrier.

In this chapter, the products liability system in the US will be explained in general, followed by an explanation of the conditions of its applicability. First, the historical background and scope of application will be discussed (1) followed by the limitations and defences (2) before discussing the damages covered by the *Products Liability Restatement* (3) and persons liable under the *Products Liability Restatement* (4). Further, the conditions of applicability will be dealt with separately (5) focusing on the question whether software could be considered a product and how these conditions will be understood in the case of defective software that is not on a physical carrier. Additionally, the statutes of limitations and repose will be discussed in order to explain what this could mean in the case of software (6). Finally, a small conclusion will provide a summary of this chapter (7).

1. Historical background and scope of application

Products liability law governing liability for the sale or other commercial transfer of a defective product that causes harm[102], is of recent origin.[103] In the beginning of the twentieth century, products liability claims slowly began to spread across the nation, but it was not until the early 1960s, beginning with the *Henningsen v. Bloomfield Motors* case[104], that products liability law arose in America. In 1963, the Supreme Courts of California decided, in the *Greennman v. Yuba Power Products Inc*. case[105], that manufacturers of defective products should be strictly liable to persons injured by defective products.[106] Shortly afterwards, in 1965, the modern products liability law was

[102] David G. Owen, *Products Liability Law* (West 2005), 1.
[103] David G. Owen, *Products Liability Law* (West 2005), 10.
[104] *Henningsen v Bloomfield Motors Inc* 161 A 2d 69 (NJ 1960).
[105] *Greenman v Yuba Power Products Inc* 377 P 2d 897 (Cal 1963).
[106] See also Reinoud Jan Johannes Westerdijk, *Productenaansprakelijkheid voor software* (West 1995), 101.

born in America when the America Law Institute memorialized the rule of strict products liability in tort in § 402A of the *Restatement (Second) of Torts*.[107]

The products liability system underwent reform and in 1998, the American Law Institute provided products liability law with its own Restatement, namely the *Restatement (Third) of Torts: Products Liability*[108],[109] in which product defectiveness was reformulated.[110] State legislatures have adopted this *Products Liability Restatement* and continue to reform it each year.[111]

The products liability regime in the US, under the *Products Liability Restatement*, is based on strict liability. This means that liability does not rest on a manufacturer's fault in producing a defective product.[112] The same liability regime applies to the seller of a defective product.[113] Therefore, product liability arises from selling a defective product, or from mispresenting product safety.[114] Due negligence is even explicitly excluded from the definition of product defectiveness in the *Products Liability Restatement*.[115] The liability is determined through a risk-utility test of defect.[116] Furthermore, it does not matter whether there is a contractual relationship between the manufacturer or seller and the injured person[117].[118]

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[107] Reinoud Jan Johannes Westerdijk, *Productenaansprakelijkheid voor software* (West 1995), 101; David G. Owen, *Products Liability Law* (West 2005), 22-23; Nancy Birnbaum 'Strict Products Liability and Computer Software' (1988) Computer/L.J., 135-137.

[108] Hereafter: *Products Liability Restatement*

[109] David G. Owen, *Products Liability Law* (West 2005), 24.

[110] Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 458-459.

[111] David G. Owen, *Products Liability Law* (West 2005), 24.

[112] Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 458; David G. Owen, *Products Liability Law* (West 2005), 33.

[113] Loes Dommering-Van Rongen, *Productaansprakelijkheid: Een rechtsvergelijkend overzicht* (Kluwer 2000), 19.

[114] David G. Owen, *Products Liability Law* (West 2005), 35.

[115] Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 459.

[116] David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 837.

[117] Reinoud Jan Johannes Westerdijk, *Productenaansprakelijkheid voor software* (West 1995), 98.

[118] Article 2 of the Uniform Commercial Code applies to the sale of goods. When software is considered a service, Article 2 UCC applies, which allows for product liability to be subject to contractual disclaimers and limitation in such context. Therefore, the products liability law and the sales law overlap with regard to that matter. A detailed explanation of this topic does not fall within the scope of this research. For further reading, see *i.a.* Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 436-441; Lawrence B. Levy,

In order to claim damages, the injured person shall be required to prove that the manufacturer's product is defective, meaning that it contained an unnecessary risk that caused harm. In other words, the injured person must prove the damage, the defect and the causal relationship between defect and damage.[119]

2. Limitations and defences

There are limitations on the product liability of a manufacturer.[120] A product cannot be classified as defective just because it may be dangerous. In some cases, the danger is obvious or even inherent so that it cannot be eliminated without destroying the product's purpose.[121] However, the fact that the risks or dangers are obvious does not relief the manufacturer from taking reasonable steps to remove said risks or dangers, for example by including some safety device that does not cost much and that does not reduce or diminish the product's usefulness.[122] Moreover, there is a duty to provide the users with warnings of hidden dangers and instructions on how to avoid them.[123] However, in most states, there is no duty to warn of obvious product risks. Obvious risks are those that would be apparent to an ordinary or reasonable user.[124] Examples hereof are the fact the knives are sharp and can cut, that cigarettes are addictive and that guns can kill. Such risks are not only obvious, but they are inherent, so that they cannot be designed away.[125]

Another limitation or defence is the state of the art, a concept that keeps evolving. The limitation of the state of the art means that manufacturers of sellers cannot be held liable for dangers that were

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Suzanne Y. Bell, Software Product Liability: Understanding and Minimizing the Risks (1989) High Tech. L.J., 1-27; Robert D. Sprague 'Software Products Liability: Has Its Time Arrived' (1991) St. U. L. Rev., p154-159.

[119] David G. Owen, *Products Liability Law* (West 2005), 34; Nancy Birnbaum 'Strict Products Liability and Computer Software' (1988) Computer/L.J., 140-141; Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 764-766.

[120] For a complete overview and detailed explanation on the limitations, see David G. Owen, *Products Liability Law* (West 2005), 621-728.

[121] David G. Owen, *Products Liability Law* (West 2005), 642.

[122] David G. Owen, *Products Liability Law* (West 2005), 38.

[123] David G. Owen, *Products Liability Law* (West 2005), 622.

[124] For a detailed explanation on the meaning of "obvious" and "inherent" dangers, see David G. Owen, *Products Liability Law* (West 2005), 636-674.

[125] David G. Owen, *Products Liability Law* (West 2005), 38.

unknown at the time the product was sold. An example hereof is asbestos, a product of which the dangers were discovered after the product was marketed. It is also possible that the manufacturer is aware of the risks or dangers of a product, but that said risks or dangers are unavoidable under the current science and technology so that they cannot be designed away.[126]

Product accidents could be caused by misconduct or abuse of the product. This could be the case if the user fails to follow the warnings of danger or instructions on use that are provided by the manufacturer or seller.[127] In such case, the accident and harm is caused wholly or partially by the user's behaviour. Therefore, the manufacturer or seller may avoid being held liable for some or all the resulting damages.[128] The *rationale* of the misuse doctrine is that products are designed to do certain limited tasks within certain use and that no product can be made safe for every kind of use. However, the manufacturer or seller remains responsible for the harm cause by a reasonably foreseeable use of a product.[129]

Compliance with contract specifications can also be seen as a limitation of the manufacturer's liability or as a defence. In such case, the defect results from the purchaser's own design instructions. The idea is that it is not fair to hold the manufacturer liable for a product that was entirely designed by the purchaser and produced according to the purchaser's contractual terms and specifications. Therefore, the manufacturer cannot be held liable for damages resulting from a defect in his product.[130]

One of the most powerful defences in the product liability law is the federal preemption of state law. This is an affirmative defence and once it arises, a product liability claim is preempted when the claim conflicts with a federal product safety statute or regulation specifying design, marketing or manufacturing standards. In other words, a products liability claim is preempted if it prohibited by a federal stature or regulation. Federal preemption may be expressed or implied. Expressed

[126] David G. Owen, *Products Liability Law* (West 2005), 675-676. For a detailed explanation on the meaning of "state of the art", see David G. Owen, *Products Liability Law* (West 2005), 675-707.
[127] David G. Owen, *Products Liability Law* (West 2005), 853.
[128] David G. Owen, *Products Liability Law* (West 2005), 792.
[129] David G. Owen, *Products Liability Law* (West 2005), 842-843.
[130] David G. Owen, *Products Liability Law* (West 2005), 878.

preemption is explicitly stated in the language of the statute, whereas implied preemption must be understood from the broader aim of the statute.[131]

3. Damages covered by the *Products Liability Restatement*

The injured person has to prove the damage caused by the defective product. Yet, not all damages are regulated or covered by the *Products Liability Restatement*. The *Products Liability Restatement* regulates the liability for physical harm to a user or consumer or to his property. In other words, the *Products Liability Restatement* regulates liability for personal injury and damage to property, but not to pure economic or financial loss. However, financial loss as a result of physical injury to the user, such as reduced work capacity, is covered by the *Products Liability Restatement*. Damage to property is not limited to the defective product itself, because damage to other property of the user or consumer are covered by the *Products Liability Restatement.*[132]

4. Persons liable under the *Products Liability Restatement*

§ 1 of the *Products Liability Restatement* states that whoever is engaged in the business of selling or distributing products who sells or distributes a defective product is subject to liability for harm to persons or property caused by the defective product. This means that not only the producer or manufacturer of a defective product is liable, but also the seller and the distributor of a defective product.[133]

However, the *Products Liability Restatement* is not a federal law, which means that the states may deviate from it. Several states have done so by limiting the liability of the seller of a defective product if a claim is possible against the manufacturer of that product.[134]

5. Conditions of applicability of the *Products Liability Restatement*

[131] David G. Owen, *Products Liability Law* (West 2005), 895-897; See also Loes Dommering-Van Rongen, *Productaansprakelijkheid: Een rechtsvergelijkend overzicht* (Kluwer 2000), 28.
[132] Loes Dommering-Van Rongen, *Productaansprakelijkheid: Een rechtsvergelijkend overzicht* (Kluwer 2000), 21.
[133] *Restatement (Third) of Torts: Products Liability*, § 1.
[134] Loes Dommering-Van Rongen, *Productaansprakelijkheid: Een rechtsvergelijkend overzicht* (Kluwer 2000), 20.

5.1. Product

5.1.1 Meaning of product under the Products Liability Restatement

The *Products Liability Restatement* is applicable when the damage was caused by a defective product. Therefore, it is important to understand the definition of a product. § 19[135] contains a definition and defines products as tangible personal property distributed commercially for use or consumption. It follows from this broad definition that the *Products Liability Restatement* applies to a very wide range of products[136].[137] Over the years, several goods have been found to be products and courts have applied strict liability to them. Examples are water, erroneous information in a manual containing instructions for the operation and maintenance of a radial saw and erroneous information in an aircraft instrument approach chart.[138]

Raw materials as well as components that are incorporated into another product fall under the definition of product as understood by the *Products Liability Restatement.* However, in order for the *Products Liability Restatement* to be applicable, the component itself needs to be defective or, the seller or distributor of the component has participated in the process of designing the component and making it part of the complete product and, as a result, the integration or incorporation of the component caused the defect that caused the damage.[139]

The *Products Liability Restatement* does not apply to intangible goods, for example information contained in books that could be considered intangible when separated from the (tangible) book.[140] As for immovable goods (real property) and electricity, these can be considered products whenever

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[135] Definition of 'Product', see RESTATEMENT (THIRD) OF TORTS: PRODUCT LIABILITY §19(a) (American Law Institute 1998).

[136] Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 463.

[137] However, the definition under the *Products Liability Restatement* is restrictive and deviates from the broader approach of §402A of the *Restatement (Second) of Torts.* The previous explanation under §402A did not explicitly preclude intangible property. See David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 840; Susan Lanoue 'Computer Software and Strict Products Liability' (1983) San Diego L. Rev., 444-445.

[138] Charles E. Cantu 'THE ILLUSIVE MEANING OF THE TERM "PRODUCT" UNDER SECTION 402A OF THE RESTATEMENT (SECOND) OF TORTS' (1991) Oklahoma Law Review, 656.

[139] Loes Dommering-Van Rongen, *Productaansprakelijkheid: Een rechtsvergelijkend overzicht* (Kluwer 2000), 22.

[140] See also David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 836.

they are used and distributed in a way that is sufficiently analogous to that of the use and distribution of movable goods.[141]

The definition of a product that is given under the *Products Liability Restatement* is not a fixed one. It is for the courts to determine whether something could be considered a product or not.[142] In addition, the commentary of § 19 states that most but not all products are tangible personal property, meaning that other things may also be considered products if they are sufficiently analogous to tangible personal property.[143] Moreover, over the years, strict liability has been applied to several kinds of products, including intangible products such as gas, electricity, and navigational charts.[144]

Services as such are not covered by the *Products Liability Restatement*,[145] but there could be hybrid transactions, which involve the sale of both a product and a service.[146] Courts have adopted several approaches on applying strict liability when dealing with such hybrid transactions. One of the approaches was the "professional/commercial" test. Under this test, the transaction will be considered professional in nature if the defendant is a professional and the transaction is a result of his/her professional skills. In such case, strict liability will not apply. Another approach was the "essence test". Under this test, courts determined whether the service or the product were the essence of the transaction, and if the service prevailed, then strict liability was not applied. A third approach was a case-by-case approach. According to this approach, every case should be viewed separately in the context of strict liability.[147]

5.1.2. Software

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[141] Loes Dommering-Van Rongen, *Productaansprakelijkheid: Een rechtsvergelijkend overzicht* (Kluwer 2000), 22; RESTATEMENT (THIRD) OF TORTS: PRODUCT LIABILITY §19 (American Law Institute 1998)

[142] Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 463.

[143] David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 837.

[144] See also Benjamin Dean 'An Exploration of Strict Products Liability and the Internet of Things' (2018), 15, available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3193049.

[145] See also David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 819.

[146] See also Susan Lanoue 'Computer Software and Strict Products Liability' (1983) San Diego L. Rev., 453-455.

[147] Lawrence B. Levy, Suzanne Y. Bell, Software Product Liability: Understanding and Minimizing the Risks (1989) High Tech. L.J., 4; David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 820-822.

As stated above (*supra*), the *Products Liability Restatement* does not mention software in the definition of a product. Moreover, the law doctrine is also divided on whether software should be considered a product or not. Just like in the EU, some scholars argue that software becomes tangible and is considered a product to which strict liability should apply when it is on a physical carrier such as a CD-ROM, or if it is a component of the machine or device on which it is installed.[148]

In addition, the existing case law is not clear on the issue of (in)tangibility of certain technological goods. In *America Online, Inc. v. St. Paul Mercury Insurance Co.*[149] for example, AOL was sued by some users who claimed that an AOL Internet access software ("AOL 5.0"), that users install on their computers to access the Internet, damaged their computer systems. AOL sued its insurer, St. Paul Mercury Insurance Company to force it to defend AOL under their insurance policy. The question in this case was whether the insurance company had the duty to defend AOL against complaints alleging that AOL 5.0 caused damage to, and loss of use of, customers' tangible property in the form of computer, computer data, software and systems. In order to answer this question, the court needed to assess whether data and software could be considered tangible products for insurance purposes. AOL said that computer data, software and systems were tangible property because they are "capable of being realized", but the insurance company argued that they are not because they cannot be touched. The court agreed with the insurance company and said that 'tangible' means that something can be touched or is perceptible to the senses. The court concluded that computer data, software and systems do not have a physical form and that they are not tangible property.[150]

In an older case, *Retail Systems, Inc. v. CNA Insurance Cos.*[151], the court reached the opposite result. Retail Systems developed computer programs and processed data with regard to voter preference. A survey was conducted by some party and the results were recorded on a computer tape which was

[148] See for example Michael C. Gemignani, Product Liability and Software (1981) Rutgers Computer & Tech. L.J., 198; David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 833-834.
[149] *America Online, Inc. v. St. Paul Mercury Insurance Co*. 207 F.Supp.2d 459 (E.D. Va. 2002), see also Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 464-465.
[150] *America Online, Inc. v. St. Paul Mercury Insurance Co*. 207 F.Supp.2d 459 (E.D. Va. 2002), see also Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 464-465.
[151] *Retail Systems, Inc. v. CNA Insurance Companies* 469 N.W.2d 735 (Minn. Ct. App. 1991).

given to Retail Systems for processing before the tape disappeared. Retail Systems filed an action against their insurer to defend them under their insurance policy. The court said that the computer data was tangible personal property because the data was of "permanent value" and "integrated completely" with the physical computer tape. Therefore, the insurer had to defend Retail System.[152] The court in *America Online, Inc. v. St. Paul Mercury Insurance Co.* argued that the reason why the court reached a different result in *Retail Systems* is the fact that both the data and the physical tape were destroyed.[153]

Although no court has ruled on applying strict liability to defective software, over the years, there has been some relevant case law that could be useful for this topic, specifically with regard to the intangible nature of software. Courts have held that some types of information will be considered products and that strict liability will apply to errors in such information. One of these cases is *Aetna Casualty and Surety Co. v. Jeppesen & Co*[154]. The navigational charts designed by Jeppeson were used by the flight crew in this case. The charts that were designed were accurate but were drawn to different scales (one of them covered a distance of 3 miles from the airport, while the other covered a distance of 15 miles from the airport) and therefore caused the plane to crash. The court came to the conclusion that the difference in scales between the charts rendered the chart defective.[155] Another navigational charts case was *Saloomey v. Jeppesen & Co*.[156] In this case, a fatal airplane crash was caused by the fact that there was inaccurate information in aeronautical charts. The charts were mass-produced[157] and users relied on them without adjusting them. Therefore, the court held

[152] *Retail Systems, Inc. v. CNA Insurance Companies* 469 N.W.2d 735 (Minn. Ct. App. 1991); see also Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 464-465.

[153] See *America Online, Inc. v. St. Paul Mercury Insurance Co.* 207 F.Supp.2d 459 (E.D. Va. 2002).

[154] *Aetna Casualty and Surety Co. v. Jeppesen & Co.* 642 F.2d 339 (9th Cir. 1981)

[155] Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 760.

[156] *Saloomey v. Jeppesen & Co.* 707 F.2d 671 (2d Cir. 1983).

[157] In some cases, such as in *Saloomey v. Jeppesen & Co.*, courts have used the term "mass-produced" when applying strict liability to defective products. This might seem as a condition for the application of strict liability, but this is not the case. The reason why courts used the term was to distinguish between a product and a service because at that time, software was often considered a service due to the fact that it was custom made and sold to few entities. Therefore, courts used the term "mass-produced" to establish the impact of the defect, namely its ability to harm a large number people. See Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 776-778.

that information was a product for strict liability purposes. The court also held that the publisher had a special responsibility as a seller to insure that users will not be injured by the use of the charts and that this responsibility lies upon Jeppesen in its role as designer, manufacturer and seller.[158] A third case was *Fluor Corp. v. Jeppesen & Co*.[159], in which a California state court was faced with the same issue. The court ruled, just like in the *Saloomey v. Jeppesen & Co.* case, that the charts were products for strict liability purposes.[160]

Another relevant case is *Winter v. G.P. Putnam's Sons*[161] in which the court held that ideas and expressions alone cannot be considered products. The case was about a book, *The Encyclopedia of Mushrooms*, that contained erroneous information about the edibility of a certain type of mushroom. The plaintiff had relied on the information mentioned in the book, so they ate a poisonous mushroom and became critically ill afterwards. The court said that the book itself was a product, but the information in the book was not a product. This case was not interesting because of its facts, but because of the *dictum* of the court in which it said that computer software may be considered a product for strict liability purposes. In this case, the court indicates that highly technical tools are capable of being considered products, even if these are literary works. The court also added that the injury does not have to be caused by the physical properties of the product, which means that it can result from malfunction of a product or from the information contained within the product.[162]

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[158] See also Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 761.

[159] *Fluor Corp. v. Jeppesen & Co.* 216 Cal. Rptr. 68 (Cal. Ct. App. 1985).

[160] Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 465; Lawrence B. Levy, Suzanne Y. Bell, Software Product Liability: Understanding and Minimizing the Risks (1989) High Tech. L.J., 5-6; Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 762.

[161] *Winter v. G.P. Putnam's Sons* 938 F.2d 1033 (9th Cir. 1991).

[162] Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 466; David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 817-818; Robert D. Sprague 'Software Products Liability: Has Its Time Arrived' (1991) St. U. L. Rev., 144; Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 759-760.

It follows from the case law cited above that a software program is not just a literary work, but a functional tool. Software is an expression of an idea that can be put to use, what makes it similar to the idea of a navigational or aeronautical chart. Therefore, software should be considered a product for strict liability purposes.[163]

In addition, although the definition under the *Products Liability Restatement* defines products as tangible personal property, this does not automatically preclude software from falling under that definition. As mentioned above (*supra*), the definition given under the *Products Liability Restatement* is not a fixed one and it is for the court to determine whether something could be considered a product or not.[164] Where the definition does not provide a clear answer in a certain case, such as in the case of software, the *Products Liability Restatement* indicates that this should be determined in the light of the public policies behind the imposition of strict liability. Some of these policy considerations include the justice of imposing the loss on the manufacturer who created the risk and reaped the profit and the superior ability of the commercial enterprise to distribute the risk of injury as a cost of doing business. These factors argue in favour of viewing software as a product and applying strict liability to it.[165]

Moreover, software is viewed as a good under Article 2 UCC, which means that it is considered tangible.[166] Further, the intangible nature of software has been set aside in other areas of the law, such as in intellectual property law where information has been viewed as a tangible item for

[163] Nancy Birnbaum 'Strict Products Liability and Computer Software' (1988) Computer/L.J., 149; Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 763-764; Reinoud Jan Johannes Westerdijk, *Productenaansprakelijkheid voor software* (West 1995), 101.

[164] Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 463.

[165] Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 466-467.

[166] Robert D. Sprague 'Software Products Liability: Has Its Time Arrived' (1991) St. U. L. Rev., 140-142; David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 838-839; Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 776.

patentability purposes.[167] Therefore, viewing software as a product for strict liability purposes would be in line with the existing practice.

5.2. Defectiveness

Defectiveness is the standard of liability which is set forth in the *Products Liability Restatement*, without negligence or fault of the producer or the seller being required. Under § 2 of the *Products Liability Restatement,* product defects are divided into three categories: manufacturing defects, design defects and warning defects.[168] A manufacturing defect means that the product departs from its intended design even though all possible care was exercised in the preparation and marketing of the product. The intended design needs to be determined and compared to the product in order to assess a manufacturing defect.[169] There is a design defect if the product's foreseeable risks of harm could have been reduced or avoided with a reasonable alternative design. This means that the defect could have been removed cost-effectively without reducing the product's usefulness. A warning defect means that the product does not come with an adequate warning of foreseeable product risks or instruction on how to avoid them.[170]

According to § 4 of the *Products Liability Restatement*, a product is not only defective in case of the three above-mentioned categories, but also when it does not comply with the mandatory regulatory standards and safety legislation that are issued in order to reduce risks.[171]

Defectiveness is assessed at the time when the product was put into circulation. The assessment is done according to the state of the art criterion, which means that the defect is assessed according to

[167] Robert D. Sprague 'Software Products Liability: Has Its Time Arrived' (1991) St. U. L. Rev., 160; Susan Lanoue 'Computer Software and Strict Products Liability' (1983) San Diego L. Rev., 446 & 451.
[168] David G. Owen, *Products Liability Law* (West 2005), 34; Loes Dommering-Van Rongen, *Productaansprakelijkheid: Een rechtsvergelijkend overzicht* (Kluwer 2000), 22.
[169] Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 459.
[170] RESTATEMENT (THIRD) OF TORTS: PRODUCT LIABILITY §2 (American Law Institute 1998); Loes Dommering-Van Rongen, *Productaansprakelijkheid: Een rechtsvergelijkend overzicht* (Kluwer 2000), 22-23; David G. Owen, *Products Liability Law* (West 2005), 35.
[171] Loes Dommering-Van Rongen, *Productaansprakelijkheid: Een rechtsvergelijkend overzicht* (Kluwer 2000), 27.

the state of scientific and technical knowledge at the time when the product was put into circulation.[172]

5.2.1. Assessing software defectiveness

(A) Manufacturing defects

There is a manufacturing defect when the product departs from the intended specifications set by the manufacturer. In the context of software, the consumer or user would have to show that the software did not operate as the manufacturer specified.[173]

The user or consumer only needs to prove that the product malfunctioned, that the malfunction occurred during proper use and that the product had not been altered or misused in a way that caused the malfunction.[174] However, in the context of software, manufacturing defects will not occur unless there is an error or a mistake in the copying of software code.[175] This means that a manufacturing defect almost never occurs in the context of software since the same code is copied over and over again and if an error occurred, then the software might not function at all, let alone cause damage.

(B) Design defects

A design defect occurs if the product is designed in an unreasonably dangerous way.[176] In determining a design defect, the risk-utility test is used to prove the defect. This test finds a product defective if the product's foreseeable risks of harm could have been reduced or avoided with a reasonable alternative design. This means that the defect could have been removed cost-effectively without reducing the product's usefulness.[177]

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[172] Loes Dommering-Van Rongen, *Productaansprakelijkheid: Een rechtsvergelijkend overzicht* (Kluwer 2000), 24.

[173] Sunghyo Kim, Crashed Software: Assessing Product Liability for Software Defects in Automated Vehicles (2017-2018) Duke L. & Tech. Rev., 304-305.

[174] Sunghyo Kim, Crashed Software: Assessing Product Liability for Software Defects in Automated Vehicles (2017-2018) Duke L. & Tech. Rev., 305.

[175] Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 778.

[176] Sunghyo Kim, Crashed Software: Assessing Product Liability for Software Defects in Automated Vehicles (2017-2018) Duke L. & Tech. Rev., 305.

[177] RESTATEMENT (THIRD) OF TORTS: PRODUCT LIABILITY §2 (American Law Institute 1998); David G. Owen, *Products Liability Law* (West 2005), 35; Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 467-468. For further reading and case law on risk-utility in design defect cases see David G. Owen 'Risk-Utility Balancing in Design Defect Cases' (1997) U. Mich. L. Reform, 239-259.

The court can take several factors into consideration when assessing a design defect under the risk-utility test. Examples of these factors are: (1) the utility of the product to the public as a whole and to the individual user; (2) the nature of the product or the likelihood that it will cause injury; (3) the availability of a safer design; (4) the potential for designing and manufacturing the product so that it is safer and reasonably priced but without limiting its functionality; (5) the ability of the user to avoid injury by careful use of the product; (6) the degree of awareness of the potential danger of the product which can reasonably be attributed to the consumer or user; and (7) the ability of the manufacturer to spread and cost related to improving the safety of the design.[178]

In the context of software, a design defect will occur when software does something unexpected, something it has not been programmed to do. What the plaintiff must prove in order to establish a design defect, depends on the jurisdiction. In some jurisdictions, it is sufficient to prove that the product design is the cause of the damage. Generally, the user needs to prove that there is a hypothetical alternative design that would be safer than the original one, as economically feasible and as practical as the original design.[179] Applied to software, the problem is often a bug so the user can easily use new versions or updates of the software that ameliorated it or corrected its bugs as proof of a reasonable alternative design.[180]

(C) Warning defects

There is a warning defect if the product does not come with an adequate warning of foreseeable product risks or instruction on how to avoid them.[181] This means that manufacturers have a duty to

[178] These factors have been identified by the New York Court of Appeals, see Sunghyo Kim, Crashed Software: Assessing Product Liability for Software Defects in Automated Vehicles (2017-2018) Duke L. & Tech. Rev., 307 and the reference made under 44.

[179] See also Benjamin Dean 'An Exploration of Strict Products Liability and the Internet of Things' (2018), 10, available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3193049.

[180] Sunghyo Kim, Crashed Software: Assessing Product Liability for Software Defects in Automated Vehicles (2017-2018) Duke L. & Tech. Rev., 308; Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 763-764.

[181] RESTATEMENT (THIRD) OF TORTS: PRODUCT LIABILITY §2 (American Law Institute 1998); Loes Dommering-Van Rongen, *Productaansprakelijkheid: Een rechtsvergelijkend overzicht* (Kluwer 2000), 22-23; David G. Owen, *Products Liability Law* (West 2005), 35.

provide adequate warning of danger and reasonable instructions on how to use the product safely. However, warning the user about the risks does not mean that the manufacturer cannot be held liable for other defects.[182]

In the context of software, the warning defect will be assessed according to the type of software and its functioning. Generally, users have no sufficient technical information to understand software. Therefore, even in the case of adequate warning and instructions of use, courts might find that such technical information fall outside the user's knowledge and hold the manufacturer liable.[183]

(D) Software defectiveness: conclusion

It is clear from the above that categories of defectiveness can be used to assess defective software for strict liability purposes. Software defects will likely be design or warning defects since manufacturing defects will not occur very often. In case of warning defects, it will depend on the type of software but it will be up to the court to decide whether the manufacturer has provided sufficient and adequate information or not. However, in case of design defects, that might occur easily since software is not bug-free, it will be easy to prove the defect by providing an alternative design which is the version without the bug.

6. Statutes of limitations and repose

Strict liability for defective products does not last for an unlimited period of time. There are maximum time limits on products liability claims that cut off a user's right after a number of years. However, in certain limited circumstances, the right to file a claim may be extended. Time-limitation statutes very from state to state, but there are two basic types: statutes of limitations and statutes of repose.[184]

[182] Sunghyo Kim, Crashed Software: Assessing Product Liability for Software Defects in Automated Vehicles (2017-2018) Duke L. & Tech. Rev., 309.
[183] Sunghyo Kim, Crashed Software: Assessing Product Liability for Software Defects in Automated Vehicles (2017-2018) Duke L. & Tech. Rev., 309.
[184] David G. Owen, *Products Liability Law* (West 2005), 920-923.

A claim is not possible if the statutory period has run, because the time-limitation statute puts an end to the user's right to file a claim.[185] Depending on the jurisdiction, statutes of limitations can vary from 1 to 6 years and they begin to run at the time of injury or when the defect is discovered by the user.[186]

Statutes of repose are different from statutes of limitations because these run at a certain time, which gives certainty to the manufacturer that his potential liability will stop after a number of years. However, statutes of repose last for a longer time of period than statutes of limitations, varying from 5 tot 20 years (depends on the state legislation) after the delivery of the product to the user or consumer.[187]

Applied to software, specifically to an update thereof, both statutes of limitations and statutes of repose should start to run if a new update replaces the software. If software is considered a product to which strict liability is applicable, then so should an update. An update is a new version of the product that fixes its bugs, improves it and/or replaces it. Therefore, in order to protect the consumers and users, an update should also be considered a product and new time limits, according to the statutes of limitations and repose should start to run with every new update.

7. Conclusion

Products liability law was born in America when the America Law Institute memorialized the rule of strict products liability in tort in § 402A of the *Restatement (Second) of Torts* and underwent reform in the the *Restatement (Third) of Torts: Products Liability.*

Whether software is a product is not determined by the *Products Liability Restatement*, nor in the case law. However, software is an expression of an idea that can be put to use, what makes it similar to the idea of a navigational or aeronautical chart that were considered products for strict liability purposes. Therefore, software should be considered a product to which the *Products Liability Restatement* is applicable.

[185] David G. Owen, *Products Liability Law* (West 2005), 920.
[186] David G. Owen, *Products Liability Law* (West 2005), 923.
[187] David G. Owen, *Products Liability Law* (West 2005), 935-938.

When assessing the defectiveness of software, manufacturing, design or warning defects could be found. Manufacturing defects will seldom occur. Warning defects will be assessed depending on the type software and it is up to the court to determine whether the manufacturer has provided adequate and sufficient information. Design defects will likely occur but will be easy to prove because the user of the software can use new versions or updates of the software that corrected its bugs as proof of a reasonable alternative design.

Finally, strict liability for defective products does not last for an unlimited period. There are statutes of limitation and statutes of repose that cut off a user's right to file a claim after a number of years. However, applied to software, specifically to an update thereof, both the statutes of limitations and statutes of repose should start to run if a new update replaces the software.

CHAPTER 4. IS SOFTWARE A PRODUCT?

In this chapter, the technical aspect of software, regardless of the fact that it is (not) on a physical carrier will be discussed according to the existing literature on software in order to understand the concept (1). Based on the previous chapters (see *supra* CHAPTER 2 and CHAPTER 3), it can be said that there is no consensus on the legal qualification of software since some scholars consider it a product while others consider it a service. Moreover, some scholars only consider it a product if it was on a physical carrier. Added to that the fact that, until today, the qualification of software as a product, has not been confirmed by case law.[188] Therefore, as a form of analysis that is partially based on the previous chapters, the qualification of software and the issues that might prevent its qualification as a product will be discussed from a legal point of view (2). Finally, a few arguments will be discussed to explain why software should be considered a product (3).

1. Technical aspect: what is software?

Software is defined in the Merriam-Webster dictionary as something used or associated with and usually contrasted with hardware, such as (a) programs for a computer, (b) the entire set of programs, procedures, and related documentation associated with a mechanical or electronic system and especially a computer system, and (c) materials for use with audio-visual equipment.[189]

Software consists of computer program code written in computer languages, for example in Java. The resulting source code is then converted into code that is understood by computers through interpretation or compilation. The difference between interpreters and compilers is the following: interpreters convert the source code into machine-readable code whenever the software is run while compilers produce machine-readable object code that is installed only once and is only recompiled if there is a change in the source code.[190]

[188] See supra Chapter 2 and Chapter 3.
[189] See the Merriam-Webster online dictionary on https://www.merriam-webster.com/dictionary/software.
[190] C. Warren Axelrood, *Engineering Safe and Secure Software Systems* (Artech House 2012), 35.

There are different types of software. There are applications software, systems software, embedded software and firmware.[191] Generally, software can be divided into two categories namely systems software and applications software. Systems software usually consists of an operating system and some fundamental utilities and is used to start and run programs.[192] This type of software is usually supplied with the system by the manufacturer and is available as soon as the system is switched on.[193] Application software on the other hand is used to accomplish specific tasks, other than running the computer system.[194]

2. Legal aspect: what is software?

2.1. Intangibility of software: goods to products

According to some scholars, when software is on a physical carrier, for example on a disc or a CD-ROM, or when it is an embedded software that forms an integral part of a computer system[195], then there is no doubt that it is considered a product and therefore the product liability laws are applicable.[196] This point of view has been confirmed in the US and in the EU by several academics.[197] The European Commission even confirmed this reasoning when it answered a parliamentary question on this matter.[198] However, if software is on a physical carrier, it is possible

[191] C. Warren Axelrood, *Engineering Safe and Secure Software Systems* (Artech House 2012), 36.
[192] See also Michel Flamée, 'Productaansprakelijkheid voor software' (1990) De Verz., 659.
[193] Diane Rowland 'Liability for Defective Software' (1991) Cambrian L. Rev., 82.
[194] C. Warren Axelrood, *Engineering Safe and Secure Software Systems* (Artech House 2012), 38-39.
[195] Diane Rowland 'Liability for Defective Software' (1991) Cambrian L. Rev., 82.
[196] Loes Dommering-Van Rongen 'Productaansprakelijkheid en software' (1988) Computerr., 228; David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 833.
[197] See for the EU *inter alia:* Britt Weyts, Thierry Vansweevelt, *Handboek Buitencontractueel Aansprakelijkheidsrecht* (Intersentia 2009) para 792; Dirk Van De Gehuchte, *Productaansprakelijkheid in België* (Mys & Breesch Uitgevers 2000), 37; Loes Dommering-Van Rongen 'Productaansprakelijkheid en software' (1988) Computerr, 228; Dimitri Verhoeven, *Productaansprakelijkheid en productveiligheid* (Intersentia 2018), para 50; Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 978-979; Diane Rowland 'Liability for Defective Software' (1991) Cambrian L. Rev., 79-80; see for the US *inter alia:* Sunghyo Kim, Crashed Software: Assessing Product Liability for Software Defects in Automated Vehicles (2017-2018) Duke L. & Tech. Rev., 311-312; Lawrence B. Levy, Suzanne Y. Bell, Software Product Liability: Understanding and Minimizing the Risks (1989) High Tech. L.J., 13; Michael C. Gemignani, Product Liability and Software (1981) Rutgers Computer & Tech. L.J., 198.
[198] Answer to Written Question No 706/88 by Mr Gijs de Vries to the Commission on product liability for computer programs, OJ C 114/42; Article 2 of the Council Directive 85/374/EEC on the approximation of the laws, regulations

that the producer of the physical carrier and the producer of the software are two different entities. It is therefore necessary to determine which producer (if not both) should be held liable.[199] Nowadays, it is possible to buy software online or to use it as a cloud computing service. How can this type of software fit within the current legal framework?

Goods can be divided according to several criteria. One possible criterion is the physical perceptibility, which allows us to distinguish between tangible and intangible goods. Software can be described as a collection of data and instructions that are organised and structured in a specific manner.[200] In that sense, it could be said that software is not a tangible good, but this does not automatically mean that product liability laws are not applicable.[201]

Instead of reading the definitions of a product in the Product Liability Directive and the *Products Liability Restatement* and saying that they do not apply to the intangible software or trying to make software conform to a definition, it might be better to consider it a good. As mentioned under Chapter 2 and Chapter 3, the current legal framework does not explicitly exclude software from falling under strict liability (see *supra*). Software shares enough characteristics of a good that it should fall under the product liability laws. Electricity, gas, blood and navigational charts have been considered goods, and so should software. Software is no different that those goods because it can also cause harm to people. Instead of viewing software as technical information, something intangible, we should focus on its functionality because it is through this functionality that software becomes tangible. It is not the technical information of software, but its functionality that can cause harm.[202] For example, software can cause harm or injury when the automatic doors of a bus close and injure someone's leg.

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and administrative provisions of the Member States concerning liability for defective products [1985] OJ L210 (Product Liability Directive).

[199] Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 24.

[200] See also Michel Flamée, 'Productaansprakelijkheid voor software' (1990) De Verz., 659.

[201] Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 28; Jochen Tanghe and Jan De Bruyne 'Aansprakelijkheid voor schade veroorzaakt door autonome motorrijtuigen' (2016-17) RW, 56; Hubert Bocken, Ingrid Boone & Marc Kruithof, *Inleiding tot het schadevergoedingsrecht* (Die Keure 2014), 317; David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 816; Diane Rowland 'Liability for Defective Software' (1991) Cambrian L. Rev., 83.

[202] Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 774-775.

2.2. From service to product

Strict liability has not been applied to software yet, but there is a historical reason since in the beginning, in de 1970s, software was not a mass-produced or marketed product. At the time, the computer industry had only produced mainframe computers for certain entities such as governments and universities, and software was either custom made or customized for the installation of the computers. The customer dealt directly with the seller who provided the devices, software, maintenance and services. The relationship between the customer and seller was usually governed by a contract and there was no need to apply strict liability to software because software was considered a service.[203] Today, operating systems like Microsoft's Windows and other programs are mass-produced and sold to numerous customers and users. These software programs are not custom made but they are programmed and written by teams of trained and skilled people. The programming of software is now routinized and there is a whole process to develop and produce software.[204] Therefore, it cannot be said that this type of software, that is available to everybody and that is being used not only in companies but also in homes, is a service.

2.2.1. Cloud computing services

Some authors argue that software cannot be considered a product because it is a service[205], and unlike product manufacturers, service providers are not strictly liable for injuries resulting from their services.[206] This brings us to cloud computing services because software comes in different forms and can be offered as a cloud computing service.

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[203] Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 461; Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 765.

[204] Michael D Scott 'Tort Liability for Vendors of Insecure Software: Has the Time Finally Come' (2008) Md. L. Rev., 461-462; David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 833-834.

[205] Duncan Fairgrieve, Geraint Howells, Peter Møgelvang-Hansen, Gert Straetmans, Dimitri Verhoeven, Piotr Machnikowski, André Janssen and Reiner Schulze, "Product Liability Directive" in Piotr Machnikowski (ed.), *European Product Liability: An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016), 67 and the cited reference.

[206] David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 819-820.

Cloud computing is a way of delivering computing resources through a network, scalable up and down to meet the requirements of its users. It is an arrangement whereby the resources are provided on a flexible and location-independent basis that allows for rapid allocation of resources.[207] Cloud computing has been widely used and has become important for different kinds of technologies, such as cell phones and connected vehicles.[208] Cloud computing is a service that was seen as a group of combined services, technologies and activities, because what happened inside the cloud was not known to the users of the services. The cloud and the services it offers have changed over time to adapt to consumer needs.[209]

Cloud services have some key characteristics. A first one is the on-demand self-service which allows a consumer to request and receive access to a service without an administrator. A second characteristic is broad network access, which allows a user to access the cloud services through a basic network connection.[210] A third characteristic is resource pooling which helps save costs and allows flexibility on the provider side. When these resources are not being used by one customer, they can be used by another customer. A fourth characteristic is rapid elasticity, meaning that a cloud environment can easily grow to satisfy user demand. A fifth characteristic is measures services, which means that cloud services must have the ability to measure usage.[211]

Nowadays, the services provided by the cloud are numerous, and new additional service are constantly being created but there are three prevalent service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS).[212]

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[207] W Kuwan Hon and Christopher Millard, "Cloud Technologies and Services" in Christopher Millard (ed.), *Cloud Computing Law* (Oxford 2013), 4; See also Gauthier Fiévet, "LE CLOUD ET LE DROIT DES OBLIGATIONS" in Catherine Delforge, Sophie Stijs & Patrick Wéry (eds.), *Het verbintenissenrecht in het leven van de onderneming* (Die Keure 2017), 6-7.

[208] Bhaskar Prasad Rimal and Ian Lumc, "The Rist of Cloud Computing in the Era of Emerging Network Society" in Nick Antonopoulos and Lee Gillam (eds.), *Cloud Computing* (Springer 2017), 3.

[209] Derrick Rountree and Ileana Castrillo, *Basics of Cloud Computing: Understanding the Fundamentals of Cloud Computing in Theory and Practice* (Elsevier Science & Technology Books 2013), 1-2.

[210] Derrick Rountree and Ileana Castrillo, *Basics of Cloud Computing: Understanding the Fundamentals of Cloud Computing in Theory and Practice* (Elsevier Science & Technology Books 2013), 2-3.

[211] Derrick Rountree and Ileana Castrillo, *Basics of Cloud Computing: Understanding the Fundamentals of Cloud Computing in Theory and Practice* (Elsevier Science & Technology Books 2013), 4-5.

[212] Derrick Rountree and Ileana Castrillo, *Basics of Cloud Computing: Understanding the Fundamentals of Cloud Computing in Theory and Practice* (Elsevier Science & Technology Books 2013), 7.

Software as a Service, or SaaS,[213] is the most commonly used type of cloud services.[214] It is a service model that provides application and data services. Through the SaaS model, the service provider can provide applications, data and all the necessary platforms and infrastructure.[215] SaaS allows users to use application software quickly without installing any specific software.[216] Platform as a Service, or PaaS, is a platform for developing and deploying software applications.[217] The idea is to provide developers with a platform that includes all the systems for developing, testing, deploying and hosting of sophisticated web applications. It helps develop business applications and various services over the internet.[218] Infrastructure as a Service, or IaaS, is the delivery of raw computing resources as a service over the internet, such as processing, storage and networks services.[219]

2.2.2. Hypothesis: home service robot

In order to use a concrete example, a hypothesis of a household robot that has sensors to collect data and process it, such as camera images, will be used. Such household robot can cause damage or injury[220] if it did not function properly. In this hypothetical example, we assume that the robot

[213] Examples of SaaS providers are Oracle, IBM and Microsoft.

[214] W Kuwan Hon and Christopher Millard, "Cloud Technologies and Services" in Christopher Millard (ed.), *Cloud Computing Law* (Oxford 2013), 6.

[215] Bhaskar Prasad Rimal and Ian Lumc, "The Rist of Cloud Computing in the Era of Emerging Network Society" in Nick Antonopoulos and Lee Gillam (eds.), *Cloud Computing* (Springer 2017), 5; Derrick Rountree and Ileana Castrillo, *Basics of Cloud Computing: Understanding the Fundamentals of Cloud Computing in Theory and Practice* (Elsevier Science & Technology Books 2013), 7.

[216] Gauthier Fiévet, "LE CLOUD ET LE DROIT DES OBLIGATIONS" in Catherine Delforge, Sophie Stijs & Patrick Wéry (eds.), *Het verbintenissenrecht in het leven van de onderneming* (Die Keure 2017), 13; W Kuwan Hon and Christopher Millard, "Cloud Technologies and Services" in Christopher Millard (ed.), *Cloud Computing Law* (Oxford 2013), 6.

[217] Gauthier Fiévet, "LE CLOUD ET LE DROIT DES OBLIGATIONS" in Catherine Delforge, Sophie Stijs & Patrick Wéry (eds.), *Het verbintenissenrecht in het leven van de onderneming* (Die Keure 2017), 12; W Kuwan Hon and Christopher Millard, "Cloud Technologies and Services" in Christopher Millard (ed.), *Cloud Computing Law* (Oxford 2013), 5.

[218] Bhaskar Prasad Rimal and Ian Lumc, "The Rist of Cloud Computing in the Era of Emerging Network Society" in Nick Antonopoulos and Lee Gillam (eds.), *Cloud Computing* (Springer 2017), 5.

[219] W Kuwan Hon and Christopher Millard, "Cloud Technologies and Services" in Christopher Millard (ed.), *Cloud Computing Law* (Oxford 2013), 5; Gauthier Fiévet, "LE CLOUD ET LE DROIT DES OBLIGATIONS" in Catherine Delforge, Sophie Stijs & Patrick Wéry (eds.), *Het verbintenissenrecht in het leven van de onderneming* (Die Keure 2017), 11; Bhaskar Prasad Rimal and Ian Lumc, "The Rist of Cloud Computing in the Era of Emerging Network Society" in Nick Antonopoulos and Lee Gillam (eds.), *Cloud Computing* (Springer 2017), 6

[220] *NB*: not all kinds of harm or damage fall within the scope of product liability laws. See *supra* Chapter 2 for the scope of application in the EU and Chapter 3 for the scope of application in the US.

caused injury to a human and that the other conditions of product liability laws are fulfilled so that the only remaining question is whether the software can be considered a product or not. If both the robot and the software were produced by the same producer, then the case is clear because there is one producer for the whole product and the software, even if it is a service, is a component of the whole product and it is on a physical carrier. Therefore, in such case, there is no doubt that product liability laws – whether EU or US law – are applicable because the product as a whole would be defective.

However, it is possible that the robot and the software were purchased separately from two different manufacturers or that they were purchased together, yet not produced by the same producer. A similar complicated situation is also possible, namely a situation in which the robot uses a software from the cloud. For example, if the robot uses its sensors to collect data and sends it to the cloud where the data is processed and sent back to the robot stating that a specific image shows that there is an empty chair and a lamp next to it. This is a cloud computing service and could be seen as an example of SaaS that helps the robot function properly, namely by mapping out the area so it does not break lamps, ruin carpets or injure a human's foot. When the robot sends data, such as images for evaluation, there is no new software or an update thereof. The robot simply uses the same software on the cloud together with the gathering of more data to help the robot function better. An important question that needs to be asked here, bearing in mind that the other conditions of product liability are fulfilled, is whether this kind of software could be considered a product to which product liability laws are applicable.

The name cloud computing 'service' is deceiving and although it might seem a mere service and not a product, so that it should be governed by contract law,[221] this does not mean that it does not fall under product liability laws. The software is written and saved somewhere and the cloud is on

[221] For a detailed explanation on cloud computing services contracts and their provisions see W Kuwan Hon and Christopher Millard, "Control, Security and Risk in the Cloud" in Christopher Millard (ed.), *Cloud Computing Law* (Oxford 2013), 19-35; Simon Bradshaw, Christopher Millard and Ian Walden, "Standard Contracts for Clouds Services" in Christopher Millard (ed.), *Cloud Computing Law* (Oxford 2013), 40-72; Gauthier Fiévet, "LE CLOUD ET LE DROIT DES OBLIGATIONS" in Catherine Delforge, Sophie Stijs & Patrick Wéry (eds.), *Het verbintenissenrecht in het leven van de onderneming* (Die Keure 2017), 1-55.

a server somewhere in a specific location.[222] Therefore, it cannot be said that there is no physical carrier, because there is a server and the victim is paying to use that specific server without having to install or download any software on their device(s). And although this server is a product that is not mass-produced nor put into circulation on the market in the traditional way, this is not a condition for the applicability of product liability laws (see *supra*). Moreover, as mentioned above, although software is technical information, something intangible, it is an expression of an idea that can be put to use, we should focus on its functionality because it is through this functionality that software becomes tangible (see *supra*).[223]

3. Why software should be considered a product

From the above, it is clear that cloud computing services are not uniform. Moreover, a service provider can provide one, few or several services, depending on the user's needs. However, regardless of who is using the services, whether the customer is a company or a private person, cloud services are covered by contracts and these are governed by contract law. Therefore, in case any damage occurs, it is covered by contractual liability. In this case, the customer is not always well protected by the contract because most agreements are established via non-negotiable contracts. Moreover, these contracts usually contain terms of service that favour providers and often contain provisions which are disadvantageous to customers. In addition, the terms and conditions may be complex and obscure, and it is not uncommon for providers to claim rights to change them unilaterally.[224] In other words, such contracts weaken the position of the consumers and considering clouds containing software as mere services harms consumers. And although it might still be possible to rely on the general tort law in case damage or injury occurs due to the use of a cloud

[222] W Kuwan Hon and Christopher Millard, "Cloud Technologies and Services" in Christopher Millard (ed.), *Cloud Computing Law* (Oxford 2013), 14-15.
[223] See *supra* Chapter 2 and Chapter 3; see *i.a.* Loes Dommering-Van Rongen 'Productaansprakelijkheid en software' (1988) Computerr., 229; Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 26; v Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 776-778.
[224] Simon Bradshaw, Christopher Millard and Ian Walden, "Standard Contracts for Clouds Services" in Christopher Millard (ed.), *Cloud Computing Law* (Oxford 2013), 33-34.

service, there is a higher burden of proof for the claimant.[225] Therefore, software should be considered a product so that strict liability can be applied to strengthen the position of the consumers.

Another argument why software should be considered a product is the fact that product liability is a mechanism that is inspired by the law and economics discipline. An important consideration why the producer bears the strict liability is the fact that he is seen as the cheapest cost avoider, which means that he can avoid damages at the cheapest cost.[226] Moreover, manufacturers and sellers possess greater knowledge regarding their products than consumers, which puts them in the best position to eliminate defects[227].[228] Added to that the fact that software is run on a device without the user's control and the fact that users usually do not understand software and its complexity.[229] Therefore, users need protection and by imposing product liability on the producer, he or she is given an incentive to invest in avoiding damages. If software is not considered a product (in the case where the producer of the software is not the producer of the physical carrier), then the producer of the software can never be held strictly liable[230] and would not have the incentive to avoid the damages.[231] This means that a claim would only be possible against the producer of the physical carrier, who is not the producer of the software and not the cheapest cost avoider.[232]

A final argument why software should be considered a product to which product liability laws are applicable is ensuring a high(er) level of safety of the product. This will encourage software

[225] Although a detailed explanation of the tort law does not fall within the scope of this research, it is mentioned for a complete analysis.

[226] Guido Calabresi, *The Costs of Accidents: A Legal and Economic Analysis* (Yale University Press 1970), 135; Stephen G. Gilles, 'Negligence, strict liability and the cheapest cost-avoider' (1992) Virginia Law Review, 1292-1293; Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 30-31.

[227] Susan Lanoue 'Computer Software and Strict Products Liability' (1983) San Diego L. Rev., 448; David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 826.

[228] In many cases, only the software programmer can avoid or prevent the errors. See Nancy Birnbaum 'Strict Products Liability and Computer Software' (1988) Computer/L.J., 148

[229] Nancy Birnbaum 'Strict Products Liability and Computer Software' (1988) Computer/L.J., 147-148; Diane Rowland 'Liability for Defective Software' (1991) Cambrian L. Rev., 81.

[230] As mentioned above, the general tort law remains applicable but imposes a higher burden of proof on the claimant.

[231] Nancy Birnbaum 'Strict Products Liability and Computer Software' (1988) Computer/L.J., 148.

[232] Jarich Werbrouck, 'Productaansprakelijkheid voor zefrijdende motorrijtuigen' (2018) TPR., 30-31; David W. Lannetti, 'Toward a Revised Definition of Product under the Restatement(Third) of Torts: Products Liability' (2000) BUS. LAW., 826-827.

manufacturers to perform enough tests to prevent defects before releasing the software into the market. It is true that software is very complex and although it contains millions of lines of code so that it is difficult to detect all defects or faults, the software industry is "no longer in its infancy".[233] Moreover, software producers gain great advantage from putting their product on the market. Software producers benefit not only from the sale of software, but also from intellectual property concepts that protect their software, because software can be protected by patent and copyright. This could lead software producers to strengthening their position by creating monopoly through using intellectual property laws. Therefore, applying strict liability to defective software seems to be a small price to pay for the great benefits that software producers reap in the market.[234] However, we need to distinguish between software that is produced and sold in millions of versions by companies such as Microsoft and IBM and software that is developed for one company, meaning that is it heavily custom-made for the specific needs of that company. In the latter case, strict liability should not apply since the software producer does not make as much money as Microsoft which means that they do not have the same means to invest in fixing bugs and resolving issues that could lead to product liability.

4. Conclusion

Software consists of computer program code written in computer languages. There are different types of software, but it can generally be divided into two categories: systems and applications software. The first usually consists of an operating system and some fundamental utilities and is used to start and run programs, whereas the latter is used to accomplish specific tasks.

The legal qualification of software as a product has not been confirmed by case law and legal scholars are divided on that matter. Some scholars argue that is should be considered a service. Although software was considered a service since it was custom made for few entities in the past, it is not the case anymore because software is now available to everyone.

[233] See also Sunghyo Kim, Crashed Software: Assessing Product Liability for Software Defects in Automated Vehicles (2017-2018) Duke L. & Tech. Rev., 312.

[234] Frances E. Zollers, Andrew McMullin, Sandra N. Hurd and Peter Shears, 'No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age' (2005) Santa Clara Computer & High Tech. L.J., 769-771.

The intangibility of software seems to be the main issue, although the legal framework (both in the EU and the US) does not exclude software from the scope of strict liability for defective products. Software is a collection of data, but we should focus on its functionality because this is through this functionality that software becomes tangible and can cause damage. Over the years, many goods have been considered products, such as electricity and gas. Software is similar to these goods and should therefore be considered a product.

Considering software as a service that is not governed by strict liability weakens the position of victims. In addition, producers are the cheapest cost avoider and possess greater knowledge regarding software. Imposing strict liability on them gives them an incentive to invest in avoiding damages. Finally, imposing strict liability ensures a higher level of safety of the product and since the software industry gains great advantage on the market, strict liability is a small price to pay for the great benefits. Therefore, software should be considered a product for product liability purposes.

CONCLUSION

This research examined whether software can be considered a product for product liability purposes and whether the existing laws on product liability, in Europe and in the US, can be applied to defective software that is not on a physical carrier.

Software consists of computer program code written in computer languages. There are different types of software, but it can generally be divided into two categories: systems and applications software. The first usually consists of an operating system and some fundamental utilities and is used to start and run programs, whereas the latter is used to accomplish specific tasks.

The legal qualification of software as a product has not been confirmed by case law and legal scholars are divided on that matter. Some scholars argue that is should be considered a service. Although software was considered a service since it was custom made for few entities in the past, it is not the case anymore because software is now available to everyone.

The intangibility of software seems to be the main issue, although the legal framework (both in the EU and the US) does not exclude software from the scope of strict liability for defective products. Whether software is a product is not determined by the Product Liability Directive, nor in the case law of the Court of Justice. Nevertheless, software should be considered a product to which the Directive is applicable. An extensive interpretation of the scope of applicability of the Directive is in line with the interpretation principles developed by the Court of Justice. Moreover, broad interpretation contributes to the level of consumer protection the Directive was intended to introduce in the Member States. The same can be said about the US since it is not determined by the *Products Liability Restatement*, nor in the case law whether software is product. However, software is an expression of an idea that can be put to use, what makes it similar to the idea of a navigational or aeronautical chart that were considered products for strict liability purposes. Therefore, software should be considered a product to which the *Products Liability Restatement* is applicable.

Finally, there are several arguments why software should be considered a product. First, considering software as a service that is not governed by strict liability weakens the position of consumers.

Second, producers are the cheapest cost avoider and possess greater knowledge regarding software. Imposing strict liability on them gives them an incentive to invest in avoiding damages. Third, imposing strict liability ensures a higher level of safety of the product and since the software industry gains great advantage on the market, strict liability is a small price to pay for the great benefits. Therefore, software should be considered a product for product liability purposes.

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