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# Product liability in the age of AI — Proposal for a "two track" solution

## Responsabilidade por produtos defeituosos na era da IA — Proposta de uma solução de "duas vias"

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**ABSTRACT:** In 1985 the Council of the European Communities adopted the Directive 85/374/EEC to harmonise product liability within Europe. In 2024, this directive will most likely be replaced by a new Product Liability Directive designed to reflect the technical developments of the last 40 years. The new Directive contains some significant changes. However, regarding the overarching concept of product liability, it remains faithful to the old Directive: Manufacturers are still not liable for all damage caused by their products, but only for damage caused by a "defect" in a product. This defect-based approach is problematic. When it comes to new digital technologies, especially Artificial Intelligence, it is difficult for courts to assess a product's defectiveness. Moreover, in many cases, the defect-based approach is insufficient to provide liability solutions that are both efficient and fair.

This paper seeks to lay the foundations for a more comprehensive reform: The current product liability for defective products should be complemented by a second "track" of product liability. In the case of particularly dangerous products, such as autonomous cars and medical devices, manufacturers should compensate victims regardless of whether their products are defective or not. Such "truly" strict liability could partially relieve courts of the burden of assessing a product's defectiveness and would lead to fair and efficient prevention and distribution of damages. Damage costs would be allocated to manufacturers as the cheapest cost avoiders. In addition, the advantages and disadvantages of dangerous products would be more evenly distributed among manufacturers, users, consumers and "innocent bystanders".

However, to avoid over-deterrence and stifling of innovations strict liability should be limited to particularly dangerous products. Legislators should introduce a general clause of truly strict liability, which would allow courts to assess whether a product is particularly dangerous or not. A general clause is preferable to a list of particularly dangerous products because it would provide for the flexibility needed to deal with rapidly developing technologies.

**KEY WORDS:** Civil Liability; Product Liability; Defect-based Liability; Strict Liability; Artificial Intelligence; Machine Learning.

**RESUMO:** Em 1985, o Conselho das Comunidades Europeias adoptou a Diretiva 85/374/CEE para harmonizar a responsabilidade decorrente dos produtos defeituosos na Europa. Em 2024, esta diretiva será muito provavelmente substituída por uma nova diretiva relativa à responsabilidade decorrente dos produtos defeituosos, concebida para refletir a evolução técnica dos últimos 40 anos. A nova diretiva contém algumas alterações significativas. No entanto, no que diz respeito ao conceito global de responsabilidade decorrente dos produtos, mantém-se fiel à antiga diretiva: os fabricantes continuam a não ser responsáveis por todos os danos causados pelos seus produtos, mas apenas pelos danos causados por um "defeito" do produto. Esta abordagem baseada no defeito é problemática. Quando se trata de novas tecnologias digitais, especialmente a Inteligência Artificial, é difícil para os tribunais avaliar o carácter defeituoso de um produto. Além disso, em muitos casos, a abordagem baseada em

defeitos é insuficiente para fornecer soluções de responsabilidade que sejam simultaneamente eficientes e justas.

O presente texto procura lançar as bases para uma reforma mais abrangente: a atual responsabilidade pelos produtos defeituosos deve ser complementada por uma "segunda via" de responsabilidade pelos produtos. No caso de produtos particularmente perigosos, como os automóveis e os dispositivos médicos, os fabricantes devem indemnizar as vítimas independentemente de os seus produtos serem ou não defeituosos.

Esta "verdadeira" responsabilidade estrita poderia aliviar parcialmente os tribunais do ónus de avaliar o carácter defeituoso de um produto e conduziria a uma prevenção e distribuição justas e eficientes dos danos. Os custos dos danos seriam imputados aos fabricantes, que seriam os que evitariam os custos mais baratos. Além disso, as vantagens e desvantagens dos produtos perigosos seriam distribuídas de forma mais equitativa entre fabricantes, utilizadores, consumidores e "espectadores inocentes".

No entanto, para evitar o excesso de dissuasão e a asfixia das inovações, a responsabilidade objetiva deve ser limitada a produtos particularmente perigosos. Os legisladores deveriam introduzir uma cláusula geral de responsabilidade verdadeiramente estrita, que permitiria aos tribunais avaliar se um produto é ou não particularmente perigoso. Uma cláusula geral é preferível a uma lista de produtos particularmente perigosos, porque proporcionaria a flexibilidade necessária para lidar com tecnologias em rápido desenvolvimento.

**PALAVRAS-CHAVE:** Responsabilidade civil; responsabilidade por produtos; responsabilidade por defeitos; responsabilidade estrita; inteligência artificial; aprendizagem automática.

## SUMMARY:

On September 28, 2022, the European Commission published a Proposal for a new Product Liability Directive (PLD Proposal).[1] According to the Explanatory Memorandum, the Proposal aims to address the shortcomings of the existing 1985 Product Liability Directive's (PLD)[2] "in the area of emerging digital technologies". To achieve this goal, the Proposal provides for some significant modifications of the current product liability regime, such as a broader definition of "product" (Art. 4(1)), an extension of the "economic operators" who can be held liable (Art. 7), duties to disclose evidence (Art. 8) and presumptions in favour of the victim (Art. 9). However, regarding the overarching concept of product liability, the Proposal remains faithful to the 1985 PLD: Under the 1985 PLD, manufacturers are not liable for all damage caused by their products, but only for damage caused by a "defect" in a product. The PLD Proposal adheres to this defect-based concept (Art. 1, Art. 6). On December 14, 2023, the Council and the European Parliament reached a provisional agreement on the new PLD. The text still has to go through the formal adoption process and be published in the Official Journal before it can enter into force. However, the provisional agreement indicates that the defect-based approach will indeed be retained in the new PLD.[3] The changes it contains compared to the Commission's Proposal are not relevant to the topic of this article and will therefore not be discussed further.

This article aims to show that the new PLD may be too cautious regarding the overarching concept of product liability and will argue for a different regime. The currently favoured defect-based approach has some significant limitations when it comes to "emerging digital technologies", in particular AI systems (1.). Therefore, it is appropriate to complement this defect-based system with "truly" strict liability for particularly dangerous products (2.). This new regime would create a "two-track" product liability and obviously raise some follow-on questions. In this article, which focuses on the *general* concept of product liability, the detailed questions cannot be answered exhaustively. The article will, however, briefly touch upon rules which could accompany the new regime, and which could be subject to further discussion (3.).

## 1. The defect-based approach of product liability and its limitations

Traditionally, product liability has been understood as the liability of the manufacturer[4] for damage caused by a "defect" in a product. This form of liability first appeared in the US in the

[1] European Commission, Proposal for a Directive of The European Parliament and of the Council on liability for defective products, COM(2022) 495 final, 28.9.2022.
[2] Council Directive 85/374/EEC on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products, OJ L 210, 7.8.1985, p. 29.
[3] Cf. European Parliament, Committee on the Internal Market and Consumer Protection, Committee on Legal Affairs, Proposal for a directive of the European Parliament and of the Council on Liability for defective products (COM(2022)0495 – C9-0322/2022 – 2022/0302(COD)), Provisional agreement resulting from interinstitutional negotiations, PE758.731v01-00, 31.1.2024.
[4] Whereas the 1985 PLD usually refers to the "producer" (cf. Art. 3 of the PLD), the PLD Proposal generally employs the term "manufacturer" (cf. Art. 4(11) of the PLD Proposal) which will equally be used in this article. The text of the provisional agreement maintains this term. In the US, product liability seems to focus on the "commercial seller or distributer", cf. § 1 of the Restatement (Third) of Torts: Products Liability (1998).

1960's.[5] The European Economic Community adopted such a regime in the 1985 PLD. Product liability is sometimes referred to as "strict" liability.[6] It is true that product liability does not require any "fault" or breach of any "duty of care" and may therefore be "stricter" than fault-based liability.[7] At the same time, it is not sufficient that a product risk has materialised.[8] Unlike other forms of strict liability, such as the liability of the holder of a motor vehicle in Germany[9] or the liability of the driver in Spain[10], product liability requires a "defect" in the system causing the damage. According to Art. 6(1) PLD a product is defective "when it does not provide the safety which a person is entitled to expect, taking all circumstances into account". Most EU jurisdictions distinguish between "manufacturing defects", "design defects" and "warning defects".[11] A product has a manufacturing defect when it departs from its intended design. In such cases, it is irrelevant whether the manufacturer could have avoided the safety flaw. Design defects and warning defects, on the other hand, require that the manufacturer could have avoided the safety flaw by adopting a reasonable alternative design or by providing reasonable warnings.[12] These requirements are very similar to the requirements for a breach of a duty of care under fault-based liability.[13] Therefore, as *Hacker* points out, product liability is not "truly strict; rather, fault resurfaces in the guise of product defectiveness".[14] Product liability is still based on the idea that manufacturers have done something "wrong", by failing to meet a standard, which they set themselves by choosing the product design (manufacturing defect) or which they could have met by taking reasonable measures (design and warning defect). Defective products must not be put into circulation. "Truly" strict liability is based on a different idea: In these cases, it is not required that the

[5] For details cf. DAVID OWEN, "'Strict' Product Liability in America and Europe" *in* Hans-Jürgen Ahrens/Christian von Bar/Gerfried Fischer/Andreas Spickhoff/Jochen Taupitz (eds.), *Festschrift für Erwin Deutsch zum 70. Geburtstag*, Heymanns, 1999, pp. 305-315, at pp. 305 et seq.; BRANDON J. RIORDAN, "Unravelling the Mystery – A Comparative Introduction to Product Liability Law in the US and Europe" *in South Carolina Journal of International Law and Business* 1(1) (2003), 27-40, at p. 29.
[6] Cf. Explanatory Memorandum to the PLD Proposal, under 1.1.
[7] DAVID OWEN, "'Strict' Product Liability in America and Europe" *in* Hans-Jürgen Ahrens/Christian von Bar/Gerfried Fischer/Andreas Spickhoff/Jochen Taupitz (eds.), *Festschrift für Erwin Deutsch zum 70. Geburtstag*, Heymanns, 1999, pp. 305-315, at p. 307.
[8] GERHARD WAGNER, "Liability Rules for the Digital Age" *in Journal of European Tort Law* 13(3) (2022), 191-243, at pp. 240 et seq.; cf. on the discussion MATHIAS REIMANN, "Product Liability" *in* Mauro Bussani/Anthony J. Sebok (eds.), *Comparative Tort Law*, Edward Elgar Publishing, 2021, pp. 236-263, at p. 244: "'Strict liability', for example, can have very different meanings"; HEIN KÖTZ, "Ist die Produkthaftung eine vom Verschulden unabhängige Haftung?" *in* Bernhard Pfister/Michael R. Will (eds.), *Festschrift für Werner Lorenz zum 70. Geburtstag*, Mohr Siebeck, 1991, pp. 109-121.
[9] Cf. Sec. 7 of the German Road Traffic Act.
[10] Cf. Art. 1.1. of the Spanish Liability and Insurance for Motor Vehicle Traffic Act.
[11] MATHIAS REIMANN, "Product Liability" *in* Mauro Bussani/Anthony J. Sebok (eds.), *Comparative Tort Law*, Edward Elgar Publishing, 2021, pp. 236-263, at p. 243; PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 15. This distinction is also used in the US, cf. DAVID OWEN, "'Strict' Product Liability in America and Europe" *in* Hans-Jürgen Ahrens/Christian von Bar/Gerfried Fischer/Andreas Spickhoff/Jochen Taupitz (eds.), *Festschrift für Erwin Deutsch zum 70. Geburtstag*, Heymanns, 1999, pp. 305-315, at pp. 309 et seq; § 2 of the Restatement (Third) of Torts: Products Liability (1998).
[12] Cf. PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 15; DAVID OWEN, "'Strict' Product Liability in America and Europe" *in* Hans-Jürgen Ahrens/Christian von Bar/Gerfried Fischer/Andreas Spickhoff/Jochen Taupitz (eds.), *Festschrift für Erwin Deutsch zum 70. Geburtstag*, Heymanns, 1999, pp. 305-315, at pp. 309 et seq.
[13] Cf. GERHARD WAGNER, "Liability Rules for the Digital Age" *in Journal of European Tort Law* 13(3) (2022), 191-243, at p. 219; PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 30.
[14] PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 30.

liable persons, e.g., the holders of motor vehicles, have done something "wrong". The activity that is subject to strict liability, e.g., holding a motor vehicle, is generally *permitted*, even though it is considered particularly dangerous by the legislator.[15] The idea behind strict liability for new technologies is to allow potentially beneficial innovation, while ensuring that the costs of potential damages are not borne by the victims but by the innovators.[16]

In the following, the defect-based approach is assessed in the light of general objectives of (product) liability. In principle, the current concept seems suited to contribute to the achievement of these goals (1.1). However, when it comes to AI systems, limiting liability to defective products poses two significant problems: First, the complexity of the underlying "emerging digital technologies" makes it difficult or even impossible for courts to determine whether a product is defective (1.2.). Second, under certain circumstances – yet to be specified –, manufacturers' liability is also appropriate for non-defective products (1.3.).

## 1.1. Objectives of liability law: Efficiency and Fairness

It is widely acknowledged that liability law generally[17] has a compensatory and a preventive function.[18] However, these objectives by themselves do not provide answers to liability questions, but need to be supplemented by further considerations.[19] An economic analysis can serve as a starting point: From this perspective, liability law should reduce the sum of the costs of accidents and the costs of avoiding accidents in order to maximise social welfare.[20] However, it is recognised that the economic considerations must be enriched by normative aspects, placing a greater emphasis on the individual level rather than solely on global gains and losses.[21] The efficiency goal is thus complemented by a fairness goal.[22]

In general, fault-based and defect-based liability regimes can contribute to achieving these goals: They incentivise manufacturers to adopt a reasonable *level of care* that, on the one hand, avoids costs of accidents and, on the other hand, does not lead to excessive costs of

[15] Cf. JOSEF ESSER, *Grundlagen und Entwicklung der Gefährdungshaftung*, C.H. Beck, 1969, at pp. 90 et seq.; HERBERT ZECH, "Liability for AI: public policy considerations" *in ERA Forum* 2021, 147-158, at p. 153.
[16] HERBERT ZECH, "Liability for AI: public policy considerations" *in ERA Forum* 2021, 147-158, at p. 153.
[17] The details of the objectives of liability law in general and product liability in particular are controversial and cannot be discussed exhaustively within the limits of this article.
[18] Cf. GERHARD WAGNER, "Comparative Tort Law" *in* Matthias Reimann/Reinhard Zimmermann (eds.), *The Oxford handbook of Comparative* Law, 2nd ed., Oxford Academic, 2019, pp. 994-1030, at pp. 996 et seq.
[19] GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at pp. 721 et seq.
[20] GUIDO CALABRESI, *The costs of accidents*, Yale University Press, 1970, p. 26 et seq.; STEVEN SHAVELL, *Foundations of economic analysis of law*, Harvard University Press, 2004, at pp. 178 et seq.
[21] Cf. GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at p. 723: "Prinzipien der ausgleichenden Gerechtigkeit und der ökonomischen Effizienz"; for a more critical view cf. HANS-BERND SCHÄFER/CLAUS OTT, *Lehrbuch der ökonomischen Analyse des Rechts*, 6th ed., Springer Gabler, 2020, at pp. 170 et seq.
[22] In US sources, references to "efficiency" and "fairness" rationales are common, cf. Restatement (Third) of Torts: Products Liability (1998); KENNETH W. SIMMONS, "*The Restatement (Third) of Torts* and Traditional Strict Liability: Robust Rationales, Slender Doctrines" *in Wake Forest Law Review* 44 (2009), 1355-1382.

avoiding accidents.[23] This appears to be efficient.[24] Since the manufacturers have done something "wrong", holding them liable also seems to be a fair outcome. However, liability law can only achieve its objectives if it is effectively enforced.[25] Otherwise, manufacturers will not be incentivised to adopt an efficient level of care, and victims will not receive fair compensation. In the context of AI, such enforcement is particularly threatened by the difficulties that courts will face in assessing whether a product might be "defective".[26]

## 1.2. Difficulties of the defect-based approach

AI-based products are usually designed using Machine Learning (ML) techniques.[27] Therefore, the design of such products is mainly determined by the *algorithms* that define the way the system learns, and the *training data* that the system receives during the learning process.[28] Consequently, the system will have a *manufacturing defect* if it is trained with a learning algorithm or with training data that deviate from the manufacturer's intended specifications.[29]

In the context of AI, identifying manufacturing defects will probably not be the biggest challenge. According to *Hacker*, most cases will "turn on design defects".[30] *Design defects* are more difficult to identify: As seen above, courts will need to determine the "reasonable" safety measures. In general, there are different ways to make this assessment, which seem to apply not only to the 1985 PLD but also to the new PLD.[31] In order to assess defectiveness, courts may first take into account product safety regulations and technical standards.[32] Art. 6(1)(f)

[23] Cf. STEVEN SHAVELL, *Foundations of economic analysis of law*, Harvard University Press, 2004, at p. 196.
[24] For a detailed economic analysis of product liability cf. HANS-BERND SCHÄFER/CLAUS OTT, *Lehrbuch der ökonomischen Analyse des Rechts*, 6th ed., Springer Gabler, 2020, at pp. 395 et seq.
[25] Cf. GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at p. 723 et seq.; HERBERT ZECH, "Liability for AI: public policy considerations" in *ERA Forum* 2021, 147-158, at p. 151; ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 67.
[26] GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at p. 729; ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 322 et seq.
[27] The definition of "Artificial Intelligence" is highly controversial. According to the OECD AI terms & concepts, an "AI system is a machine-based system that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments. Different AI systems vary in their levels of autonomy and adaptiveness after deployment", https://oecd.ai/en/ai-principles (last accessed: 26.2.2024).
[28] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 252.
[29] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 252 et seq.
[30] PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 15.
[31] Art. 6(1) of the PLD Proposal only slightly modifies the definition of a defect: "A product shall be considered defective when it does not provide the safety which the public at large is entitled to expect". The PLD Proposal provides a few more guidelines than the current PLD, but they appear to be mainly declaratory, cf. Explanatory Memorandum to the PLD Proposal, under 5: "The test for determining whether a product is defective [...] is substantively the same as under the PLD. However, in order to reflect the changing nature of products in the digital age, and to reflect case law of the CJEU, factors such as the interconnectedness or self-learning functions of products have been added to the non-exhaustive list of factors to be taken into account by courts when assessing defectiveness." Cf. JAN DE BRUYNE/ORIAN DHEU/CHARLOTTE DUCUING, "The European Commission's approach to extra-contractual liability and AI – An evaluation of the AI liability directive and the revised product liability directive" *in Computer & Law Security Review* 51 (2023), 105894, at p. 13: "Welcome clarifications of defectiveness in the AI context".
[32] Cf. ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 275 et seq.; PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 16.

of the PLD Proposal explicitly invites courts to consider "product safety requirements, including safety-relevant cybersecurity requirements". The text of the provisional agreement even includes such requirements in the definition of "defectiveness": "A product shall be considered defective when it does not provide the safety that a person is entitled to expect or that is required under Union or national law."[33] However, written regulations for AI-based products are still rare.[34] The future AI Act[35] is likely to prohibit some practices. Such products could be considered defective per se. For other systems, especially so-called high-risk AI systems, the AI Act provides some safety requirements, but most of them are rather abstract and will need to be supplemented by more precise rules.[36] Secondly, courts can compare a product's risks with comparable risks. In the case of AI-based products striving for human-like "intelligence", it seems plausible to compare their safety with the safety ensured by a human performing the same task as the product.[37] For example, an autonomous car may be considered defective if it causes more accidents on average[38] than human drivers. However, there are difficulties with this comparison: AI systems tend to work differently from humans.[39] While humans often act intuitively, AI systems usually take decisions by calculating probabilities. Both approaches have their advantages and disadvantages. For example, an autonomous car may cause fewer accidents than human drivers in regular traffic scenarios. Yet, it may face challenges when presented with novel situations. In a famous 2018 study, researchers manipulated a stop sign by placing stickers on it. This comparatively simple modification led to a large increase in misclassifications by the AI system.[40] In such situations, human intuition could offer an advantage over computational power, as it allows for quick adaptation to unknown scenarios.[41] Furthermore, the human level of safety will usually only serve as a minimum standard. Technological progress will raise expectations beyond human performance.[42] Therefore, an AI-

[33] The guidelines provided for in the PLD Proposal (*supra* note 31) are largely maintained in the provisional agreement and only slightly modified and supplemented.
[34] PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 16.
[35] Cf. the Proposal for a Regulation of the European Parliament and of the Council on harmonised rules on Artificial Intelligence (Artificial Intelligence Act) and amending certain Union Legislative Acts, COM(2021) 206 final, 21.4.2021. The Council and the European Parliament reached a provisional agreement on December 9, 2023. However, at the time of the writing, the text has not yet been formally adopted.
[36] Cf. DAVID BOMHARD/MARIEKE MERKLE, "Europäische KI-Verordnung – Der aktuelle Kommissionsentwurf und praktische Auswirkungen" *in Recht Digital* 2021, 276-282, at p. 283. Some efforts to establish more precise guidelines already exist. For example, in 2024, ISO and IEC published the standard "ISO/IEC TR 5469:2024 Artificial intelligence — Functional safety and AI systems".
[37] Cf. on such approaches PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at pp. 15 et seq.; GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at pp. 727 et seq.; ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 260 et seq.
[38] When assessing defectiveness, courts must look at the *general* performance of the product. Therefore, it is not sufficient that an AI system has caused a *specific* accident that a human could have avoided, cf. GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at p. 728.
[39] GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at p. 728; ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 261 et seq.
[40] KEVIN EYKHOLT/IVAN EVTIMOV/EARLENCE FERNANDES/BO LI/AMIR RAHMATI/CHAO-WEI XIAO/ATUL PRAKASH/TADAYOSHI KOHNO/DAWN SONG, "Robust Physical-World Attacks on Deep Learning Visual Classification" *in 2018 IEEE/CVF Conference on Computer Vision and Pattern Recognition*, IEEE, 2018, pp. 1625–1634.
[41] For a general overview on the differences between human and artificial "intelligence" cf. ERIK J. LARSON, *The Myth of Artificial Intelligence*, Harvard University Press, 2021; KATHARINA ZWEIG, *Die KI war's!,* Heyne, 2023.
[42] Cf. GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at p. 727; ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 263.

based product must also be compared to other AI-based products.[43] For example, an autonomous car may be considered defective if it causes more accidents on average than autonomous cars from competing manufacturers.[44] However, individual AI systems show considerable variability and can therefore be difficult to compare.[45] For example, an AI-based medical diagnostic device may be better at detecting a disease, while a competing device may be better at avoiding false positives.[46] If both the lack of medical treatment and the medical treatment itself can cause harm, it is difficult to compare the safety of the two devices. Therefore, in many cases, courts will ultimately only be able to assess defectiveness by weighing the costs and benefits of additional safety measures.[47] They would have to carry out a "risk-utility test".[48] Such a "cost/benefit-analysis"[49] may not only be limited to monetary considerations, but may also include normative aspects, such as intangible risks and benefits of a design.[50] Thus, both efficiency and fairness considerations can be taken into account. However, when it comes to AI systems, this third method is also challenging: The behaviour of such systems depends on many factors.[51] Whether a particular measure, such as using different training data or a slightly different learning algorithm, would have provided a safety benefit that outweighed its costs, might be difficult to determine.[52] The difficulties are further compounded when the complexity of the underlying technology makes it impossible for humans to retrace the system's learning process.[53] Particular challenges also arise when the product continues to learn after its deployment or when it is interconnected with other

[43] Cf. PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 16 et seq.; GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at p. 728 et seq

[44] The example of an autonomous car is discussed in detail by GERHARD WAGNER, "Produkthaftung für autonome Systeme" *in Archiv für die civilistische Praxis* 217 (2017), 707-765; for a US perspective cf. MARK GEISTFELD, "A Roadmap for Autonomous Vehicles: State Tort Liability, Automobile Insurance, and Federal Safety Regulation", *in California Law Review* 105 (2017), 1611–1694.

[45] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 265 et seq.

[46] Cf. HANNAH FRY, *Hello World*, C.H. Beck, 2019, at p. 213.

[47] Cf. PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 16 et seq.; GERHARD WAGNER, "Liability Rules for the Digital Age" *in Journal of European Tort Law* 13(3) (2022), 191-243, at p. 205; ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 267 et seq.

[48] OWEN, DAVID, "'Strict' Product Liability in America and Europe" *in* Hans-Jürgen Ahrens/Christian von Bar/Gerfried Fischer/Andreas Spickhoff/Jochen Taupitz (eds.), *Festschrift für Erwin Deutsch zum 70. Geburtstag*, Heymanns, 1999, pp. 305-315, at pp. 306 et seq. The cost-benefit or risk-utility test was originally conceived as an alternative to the "consumer expectations test". The 1985 PLD seemed to have favored the latter. However, as a "pure" consumer expectations test presents several problems, for example in the context of unknown risks which are accordingly "unexpected", but which might still need to be avoided, there is consensus that it needs to be replaced or at least complemented by further considerations, namely a risk-utility-test. The wording of both the 1985 PLD and the PLD Proposal allow to apply this test, cf. GERHARD WAGNER, "Liability Rules for the Digital Age" *in Journal of European Tort Law* 13(3) (2022), 191-243, at pp. 204 et seq.; PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 14 et seq. The text of the provisional agreement does not question this approach either.

[49] GERHARD WAGNER, "Liability Rules for the Digital Age" *in Journal of European Tort Law* 13(3) (2022), 191-243, at p. 204.

[50] Cf. MARTIN SOMMER, *Haftung für autonome Systeme*, Nomos, 2020, at pp. 233 et seq.

[51] KARNI CHAGAL-FEVERKORN, "Am I an Algorithm or a Product?" *in Stanford Law & Policy Review 30* (2019), 61-114, at pp. 91 et seq.

[52] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 269; cf. on the general difficulty of courts "to calculate all costs and benefits of the overall design of a complex product" DAVID OWEN, "'Strict' Product Liability in America and Europe" *in* Hans-Jürgen Ahrens/Christian von Bar/Gerfried Fischer/Andreas Spickhoff/Jochen Taupitz (eds.), *Festschrift für Erwin Deutsch zum 70. Geburtstag*, Heymanns, 1999, pp. 305-315, at p. 311.

[53] Cf. MALTE GRÜTZMACHER, "Die zivilrechtliche Haftung für KI nach dem Entwurf der geplanten KI-VO" *in Computer und Recht* 2021, 433-444, at p. 436.

systems.[54] Art. 6(1)(c) and (d) of the PLD Proposal explicitly require courts to take these aspects into account but do not provide any guidance as to *how* courts should assess them.[55]

A product is deemed to have a *warning defect* when the risk could have been mitigated through reasonable instructions. Again, courts must make a cost-benefit analysis.[56] In general, manufacturers must inform users about product risks which the users are able to avoid and about risks that are not controllable. The former enables users to avoid damages by using the product correctly. The latter enables them to make an informed choice: On the basis of the information on the residual risks, users may decide not to use the product, thereby increasing the overall level of safety.[57] Therefore, manufacturers must inform users about the statistical frequency and potential consequences of damages.[58] In principle, a warning defect can also result from the impossibility of explaining the behaviour of a product ("Black Box"). The lack of information about a system's functioning may prevent the user from adequately monitoring the product: A doctor receiving advice from an AI system may need to understand the system's motives before implementing its advice in a medical treatment.[59] However, in such cases the costs of the measure may outweigh its benefits, especially if the Black Box AI outperforms possible alternatives by statistically avoiding more harm. For courts, it is difficult to solve such *trade-offs*.[60] Furthermore, inexplicability will not lead to a warning defect if the product automatically implements its decision, without any prior review by a user. In such cases, the general safety level would not be improved by enabling the user to explain the behaviour. Explainability can only make it easier to prove a defect in court.[61]

Courts may also face various difficulties in assessing the *causal link* between the defectiveness and the damage (Art. 1 of the PLD, Art. 1 of the PLD Proposal).[62] For example, a court may find that an AI-based product has an accuracy of 70 %, but it could have achieved 80 % if it had been trained with different training data. Based on the cost-benefit test, this may lead to a design defect. However, if it is not possible to retrace the learning process, it may be impossible to assess whether the alternative design – different training data – would also have avoided the concrete error that led to the claimant's damage in the particular case. The specific error may be among the 20 % that could not have been avoided by an alternative design

[54] PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 5; for a detailed analysis of the "interconnectivity Risk" cf. ANNA BECKERS/GUNTHER TEUBNER, *Three Liability Regimes for Artificial Intelligence: Algorithmic Actants, Hybrids, Crowds*, Hart Publishing, 2021, at pp. 116 et seq.
[55] Cf. on the possibility of ambivalent interpretations of Art. 6(1)(c) JAN DE BRUYNE/ORIAN DHEU/CHARLOTTE DUCUING, "The European Commission's approach to extra-contractual liability and AI – An evaluation of the AI liability directive and the revised product liability directive" *in Computer & Law Security Review* 51 (2023), 105894, at pp. 13 et seq.
[56] Cf. on the similar definitions DAVID OWEN, "'Strict' Product Liability in America and Europe" *in* Hans-Jürgen Ahrens/Christian von Bar/Gerfried Fischer/Andreas Spickhoff/Jochen Taupitz (eds.), *Festschrift für Erwin Deutsch zum 70. Geburtstag*, Heymanns, 1999, pp. 305-315, at p. 311.
[57] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 285 et seq.
[58] GERHARD WAGNER, "Produkthaftung für autonome Systeme" *in Archiv für die civilistische Praxis* 217 (2017), 707-765, at pp. 739, 748; MARK GEISTFELD, "A Roadmap for Autonomous Vehicles: State Tort Liability, Automobile Insurance, and Federal Safety Regulation", *in California Law Review* 105 (2017), 1611–1694, at pp. 1654 et seq.
[59] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 287.
[60] On the "trade-off between traceability and precision" cf. RALF T. KREUTZER/MARIE SIRRENBERG, *Understanding Artificial Intelligence*, Springer, 2020, at p. 20.
[61] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 287.
[62] Cf. ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 322.

either.[63] Similarly, in case of a warning defect consisting in a lack of information about the statistical performance of a product, it may be difficult to establish whether a well-informed user would have refrained from using the system and thus avoided the damage.[64]

In view of these difficulties, in the context of AI, there will often be situations in which courts may not be able to establish the existence of a defect or the causal link. According to Art. 4 of the PLD, Art. 9(1) of the PLD Proposal the burden of proof generally lies with the claimant. Consequently, in case of uncertainty, the claimant will not be compensated. This may lead to decisions that reflect the actual situation – if there is *no* defect or no causal link. However, there will also be numerous cases where the victim *has* a claim under the PLD but can't enforce it. In such cases, as mentioned above, product liability law does not achieve its objectives.

The PLD Proposal provides two mechanisms to avoid such cases: First, Art. 8 of the PLD Proposal provides for the disclosure of evidence. This may make it easier for courts to determine whether the damage was caused by a defect in the product. However, many of the difficulties explained above are not due to the courts' inability to access available information, but to a general lack of human knowledge about the functioning of the learning process and the behaviour of the AI system. Such problems cannot be overcome by a party's disclosure obligation, as there is no "relevant evidence that is at its disposal" (cf. Art. 8(1) of the PLD Proposal). Disclosure of evidence addresses "institutional opacity" which, according to *Hacker,* consists in "strategic withhold of information", but it cannot overcome "technical opacity", the "difficulty of pinpointing the causes of a model's output due to its technical complexity".[65] Second, Art. 9 of the PLD Proposal provides for some (rebuttable) presumptions of defectiveness and of the causal link between the defectiveness of the product and the damage. If their conditions are met, the remaining uncertainty is borne by the manufacturer. This mechanism could effectively mitigate instances of under-compensation and under-deterrence.

Art. 8 and 9 of the PLD Proposal will not be discussed in detail in this article.[66] The provisional agreement reached in December 2023 maintains these general mechanisms while changing some of the details. Even if these provisions were entirely convincing, there would still be instances, where the defect-based approach would fall short: As will be shown in the following section, in some cases it is justified to hold manufacturers liable even if the absence of a defect or a causal link between the defectiveness and the damage is *proven*.

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[63] For a similar example cf. ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 350 et seq. (in the context of users' fault-based liability).
[64] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 326.
[65] PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 35.
[66] A discussion can be found in JAN DE BRUYNE/ORIAN DHEU/CHARLOTTE DUCUING, "The European Commission's approach to extra-contractual liability and AI – An evaluation of the AI liability directive and the revised product liability directive" *in Computer & Law Security Review* 51 (2023), 105894, at pp. 15 et seq.; PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at pp. 17 et seq.; GERALD SPINDLER, "Die Vorschläge der EU-Kommission zu einer neuen Produkthaftung und zur Haftung von Herstellern und Betreibern Künstlicher Intelligenz" *in Computer und Recht* 2022, 689-704, at pp. 695 et seq.; GERHARD WAGNER, "Liability Rules for the Digital Age" *in Journal of European Tort Law* 13(3) (2022), 191-243, at pp. 216 et seq.

## 1.3. Insufficiencies of the defect-based approach

As mentioned above, the defect-based approach incentivises manufacturers to adjust their *level of care*. In principle, the cost-benefit test can encourage efficient behaviour that reduces the sum of damages costs and damage avoidance costs. Fairness aspects can generally be considered through its normative component.[67] Nevertheless, this test – as well as the other methods of assessment – may not always lead to satisfactory results.

From an economic perspective, the main limitation of fault-based or defect-based liability is the inability of these regimes to influence the *level of activity* of the liable party. Once manufactures have taken all "reasonable" measures, they do not have any incentives to further reduce damage costs, by generally putting fewer products into circulation,[68] or by avoiding selling the products to people who use them in a particularly dangerous way.[69] Rather, they will continue increasing their sales even if the additional damage costs outweigh the additional social benefits. This will not have a significant impact on social welfare if the damage costs caused by non-defective products are not significant,[70] or if the product is of high social value.[71] In the opposite case, however, "excessive activity levels"[72] may lead to significant social costs. With regards to AI-based products, it seems that there will indeed be a considerable number of damages caused by non-defective products: As manufacturers only decide upon the algorithm and the training data and cannot fully control the learning process and the resulting characteristics of the product, courts may often find that they could not have improved safety by any reasonable measure.[73] There will be many cases where the damage is not caused by a defect but by the product's autonomous behaviour.[74] As a further limitation, the defect-based approach does not incentivise manufacturers to seek new safety measures that are not yet "reasonable", but which may achieve greater safety in the future. However, in the context of rapidly emerging technologies, such as AI, where the potential to improve safety is high, some pressure to innovate may be appropriate to maximise social welfare.[75]

In addition, denying manufacturers' liability could lead to a distribution of damages that appears neither efficient nor fair. For example, an autonomous vehicle could be considered non-defective, because it conforms to its intended design and all written standards, causes fewer accidents than human drivers and competing autonomous vehicles, and could not have

[67] Cf. MARTIN SOMMER, *Haftung für autonome Systeme*, Nomos, 2020, at pp. 233 et seq.
[68] Cf. STEVEN SHAVELL, *Foundations of economic analysis of law,* Harvard University Press, 2004, at p. 196.
[69] HANS-BERND SCHÄFER/CLAUS OTT, *Lehrbuch der ökonomischen Analyse des Rechts*, 6th ed., Springer Gabler, 2020, cf. at p. 415; cf. equally PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 31 ("particularly important for high-risk AI systems").
[70] Cf. Cf. STEVEN SHAVELL, *Foundations of economic analysis of law*, Harvard University Press, 2004, at pp. 197 et seq.; HANS-BERND SCHÄFER/CLAUS OTT, *Lehrbuch der ökonomischen Analyse des Rechts*, 6th ed., Springer Gabler, 2020, at p. 256.
[71] Cf. on the latter KENNETH W. SIMMONS, "*The Restatement (Third) of Torts* and Traditional Strict Liability: Robust Rationales, Slender Doctrines" *in Wake Forest Law Review* 44 (2009), 1355-1382, at p. 1360.
[72] STEVEN SHAVELL, *Foundations of economic analysis of law*, Harvard University Press, 2004, at p. 196.
[73] Cf. ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 384.
[74] Cf. GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at p. 728.
[75] On the general idea to encourage innovation by installing strict liability cf. ANDREAS BLASCHCZOK, *Gefährdungshaftung und Risikozuweisung*, Heymann, 1993, at pp. 306 et seq ("Innovationsdruck").

been improved by any reasonable safety measure. As a result, the manufacturer would not be liable if, exceptionally, the car injured a pedestrian. This outcome does not seem efficient: In this case, the costs of the damage – which are usually high in the context of road traffic – fall heavily on the individual pedestrian. On the other hand, if manufacturers were liable, they would offset these costs through higher car prices. The damage costs would be spread over many shoulders, which would generally reduce their impact.[76] At the same time, higher car prices can lead to a reduction of the activity level and corresponding damages, as they lead to a decrease in consumption.[77] In addition, manufacturers would also be able to contract third party liability insurance which would lead to a further distribution of damage costs.[78]

Making manufacturers – and their clients – pay for the damage also seems justified on grounds of fairness since they are the main beneficiaries of the product.[79] This last argument is particularly strong when the victim is an "innocent bystander", such as a pedestrian. However, even if the user of a product is injured, such as the passenger of an autonomous car, it seems generally justified to hold the manufacturer liable. Which user is hit may be a matter of chance.[80] Furthermore, if the user has contributed to the damage in a particular way, the claim may be reduced (cf. Art. 8(2) of the PLD; Art. 12(2) of the PLD Proposal).[81] In the case of the autonomous car, victims may have a claim against the holder or driver of the car under German or Spanish national law.[82] However, in other cases where the non-defective product is not subject to a specific and stricter liability regime, they would be left without compensation.

## 2. Truly strict liability as an appropriate complement to the defect-based approach

In view of these limitations, it is appropriate to complement the defect-based approach by a new product liability regime. The difficulties and insufficiencies can be avoided by introducing "truly" strict liability of manufacturers. However, strict liability also has its disadvantages, which must be weighed against the potential benefits (2.1.). As will be shown in the following, only a differentiated approach is justified. Truly strict liability should only apply where a product presents a particular risk (2.2.). If, however, such a risk materialises, it is the manufacturer – not the user – who should bear the damage costs (2.3.).

[76] Cf. on "secondary accident costs" and "loss spreading" GUIDO CALABRESI, *The costs of accidents*, Yale University Press, 1970, at pp. 39 et seq.
[77] GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at p. 735.
[78] HERBERT ZECH, "Liability for AI: public policy considerations" *in ERA Forum* 2021, 147-158, at p. 152.
[79] Cf. PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 31 who highlights the "old adage that those who reap the benefits of a particular product should also bear the burden".
[80] Cf. ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 378.
[81] Cf. on the economic effects of defenses of contributory negligence STEVEN SHAVELL, *Foundations of economic analysis of law*, Harvard University Press, 2004, at pp. 201 et seq.
[82] Cf. JAN DE BRUYNE/ORIAN DHEU/CHARLOTTE DUCUING, "The European Commission's approach to extra-contractual liability and AI – An evaluation of the AI liability directive and the revised product liability directive" *in Computer & Law Security Review* 51 (2023), 105894, at p. 4.

## 2.1. Benefits and downsides of truly strict product liability

Truly strict liability has some significant benefits: Similar to defect-based liability, it incentivises manufacturers to avoid damages by taking reasonable safety measures and may therefore equally lead to an efficient level of care.[83] In addition and unlike defect-based liability, it may have an impact on the activity level of the manufacturers: When putting products into circulation, manufacturers also need to take into account potential damage that occurs despite all reasonable safety measures having been taken. They must internalise *all* damage costs.[84] Therefore, they may avoid selling their products to particularly dangerous users, reduce overall sales or charge higher prices – which equally reduces sales.[85] This behaviour can reduce social costs and promote social welfare. Furthermore, manufacturers may be incentivised to carry out more research to develop new safety measures.[86] In addition, damage costs will be paid by those who benefit from the product: the manufacturers and their clients.[87]

However, strict liability also has its downsides: In particular, it can lead to an over-deterrence. Manufacturers may be discouraged from bringing new products to the market, even if they are of high social value and do not cause high damages ("chilling effect").[88] The fear of liability may lead to excessive reduction of the activity level, preventing the realisation of a product's social benefit and thus impairing social welfare. Third-party insurance cannot fully prevent this problem, but can only mitigate it.[89] Ultimately, whether truly strict liability is appropriate will depend on the specific product and its intended use.[90] For example, in the case of autonomous cars, the advantages of truly strict liability seem to outweigh its disadvantages: Such products can cause serious damage, even when they are not defective and used correctly. In these cases, on the one hand, exceeding the optimal level of the activity can produce significant social costs.[91] On the other hand, there may be a notable disparity between the losses suffered by individual victims (serious damages) and the benefits received by manufacturers and the general public, in particular their clients (useful products available for sale and consumption).[92] However, strict liability may not be justified in other cases, where these conditions are not met.[93] For example, a "smart" greenhouse may occasionally make mistakes and damage some

[83] STEVEN SHAVELL, *Foundations of economic analysis of law*, Harvard University Press, 2004, at p. 196.
[84] HERBERT ZECH, "Liability for AI: public policy considerations" *in ERA Forum* 2021, 147-158, at p. 152 who equally highlights that strict liability allows the state to delegate the risk assessment to the developers of the technology, thereby making private risk knowledge available.
[85] Cf. STEVEN SHAVELL, Foundations of economic analysis of law, Harvard University Press, 2004, at pp. 196; HANS-BERND SCHÄFER/CLAUS OTT, Lehrbuch der ökonomischen Analyse des Rechts, 6th ed., Springer Gabler, 2020, cf. at p. 415; GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at p. 735.
[86] HERBERT ZECH, "Liability for AI: public policy considerations" *in ERA Forum* 2021, 147-158, at pp. 152 et seq.
[87] Cf. PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023) 105871, at p. 31.
[88] Cf. KARNI CHAGAL-FEVERKORN, "Am I an Algorithm or a Product?" *in Stanford Law & Policy Review* 30 (2019), 61-114, at p. 82; HERBERT ZECH, "Liability for AI: public policy considerations" *in ERA Forum* 2021, 147-158, at p. 153.
[89] Cf. ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 226.
[90] Cf. KARNI CHAGAL-FEVERKORN, "Am I an Algorithm or a Product?" *in Stanford Law & Policy Review* 30 (2019), 61-114, at p. 82.
[91] Cf. STEVEN SHAVELL, Foundations of economic analysis of law, Harvard University Press, 2004, at pp. 197 et seq.
[92] Cf. ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 176.
[93] Cf. ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 385 et seq.; cf. equally MELINDA F. LOHMANN, "Roboter als Wundertüten – eine zivilrechtliche Haftungsanalyse" *in Aktuelle Juristische Praxis* 2/2017, 152-162, at p. 161 who contrasts industry robots and smaller, harmless

plants without necessarily being considered defective. Extending liability in this case may be less appropriate and could unduly hinder product diversity and innovation: At a global level, the – comparatively small – damage suffered by the victims does not significantly increase social costs. At the individual level, such damages can be considered as a part of the general risk of life of all people.

Given these benefits and downsides and the differences between products, truly strict liability should only be introduced through a differentiated approach.[94]

## 2.2. Differentiated approach: A general clause of truly strict liability

Truly strict liability should be limited to particularly dangerous products. This differentiated concept aligns with the "risk-based approach" that is likely to underpin the future AI regulation in the EU.[95] Regarding liability for AI systems, risk-based solutions have been proposed by the European Parliament in a Recommendation of 2020[96] and by various scholars[97].

Differentiated solutions naturally raise the question of *how* to distinguish.[98] *Hacker* recently proposed truly strict liability for "illegitimate-harm, high-risk (and prohibited) AI models". Illegitimate-harm models are "AI systems that, from a social perspective, should not cause harm during their correct operation; legitimate-harm models, conversely, are meant to cause harm if functioning properly." *Hacker* identifies autonomous driving and medical AI as candidates for strict liability.[99] Credit scoring, insurance and recruitment are cited as examples where the model is meant to cause harm to some people, for example by rejecting candidates.[100] At least as far as general product liability is concerned – *Hacker* focuses on AI – this regime might be too strict: Some products are *not meant* to cause harm, but it is still

entertainment robots; CHRISTIANE WENDEHORST, "Strict Liability for AI and other Emerging Technologies" *in Journal of European Tort Law* 11(2) (2020), 150-180, at p. 173 who lists "AI-driven delivery or large cleaning robots or big lawnmower in public spaces" as candidates for strict liability.

[94] Cf. PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 30.

[95] Cf. the explanations of the European Commission, https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai (last accessed: 26.2.2024).

[96] European Parliament resolution with recommendations to the Commission on a framework of ethical aspects of artificial intelligence, robotics and related technologies, 2020/2012(INL), 20.10.2020. The Recommendation focuses on the liability of the "operator", cf. Art. 4 of the recommended Proposal for a Regulation.

[97] Examples: JAN-PHILIPP GÜNTHER, *Roboter und rechtliche Verantwortung*, Herbert Utz Verlag, 2016, at p. 241; MARIO MARTINI, "Algorithmen als Herausforderung für die Rechtsordnung" *in Juristenzeitung* 72 (2017), 1017-1072, at p. 1024; MELINDA F. LOHMANN, "Roboter als Wundertüten – eine zivilrechtliche Haftungsanalyse" *in Aktuelle Juristische Praxis* 2/2017, 152-162, at p. 161; BETTINA HEIDERHOFF/KILIAN GRAMSCH, "Klassische Haftungsregimes und autonome Systeme – genügt „functional equivalence" oder bedarf es eigenständiger Maßstäbe?" *in Zeitschrift für Wirtschaftsrecht* 2020, 1937-1943, at p. 1941; CHRISTIANE WENDEHORST, "Strict Liability for AI and other Emerging Technologies" *in Journal of European Tort Law* 11(2) (2020), 150-180, at pp. 171 et seq.; GERALD SPINDLER, "Neue Haftungsregelungen für autonome Systeme?" in *Juristenzeitung* 77 (2022), 793-852, at p. 799; PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at pp. 30 et seq.

[98] PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 31.

[99] PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 31.

[100] PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 32.

justified that the harm they cause is borne by the victim. Examples could be the "smart" greenhouse or a small entertainment robot[101]. At the same time, products that must not cause any harm and therefore must not be sold if they cannot guarantee complete safety should be considered *defective* if they do not fulfil this guarantee. In such cases, strict liability may apply alongside defect-based liability. However, as mentioned above, the risks that strict liability is primarily concerned with are those, which are generally *permitted* but still need to be compensated when they materialise.[102] Consequently, strict liability should be aimed at products that present a particular risk even when they are not considered defective and are used correctly. The "particularity" of a risk depends mainly on its magnitude, which is determined by the seriousness and the likelihood of the damage.[103] However, it also seems possible to consider the social value of an activity. In the light of the explanations above, this is consistent with both the efficiency and the fairness rationale: It is more important to incentivise manufacturers to adjust their activity level when the activity is of low social value. Moreover, in such a case it does not seem fair to leave the victims, who do not even benefit from the product as part of the general public, without compensation.[104]

Another question is *who* should make the distinction. One possibility is to draw up a list of "high-risk" products, along the lines of the AI Act and the 2020 Recommendation. However, such a list may not be able to keep up with the rapid development of new technologies. This could lead to inconsistent results for strict liability. Therefore, it may be better to leave some discretion to the courts to determine whether a product is particularly dangerous. Eventually, strict product liability should take the form of a *general clause*. General clauses of truly strict liability offer flexibility. It is arguably easier for courts to decide whether a product is particularly dangerous than to assess whether such a product is defective. In case of a general clause of truly strict liability, judges are not obligated to ascertain the safety measures that could have been reasonable. Instead, they need only consider the residual risk of the product, determined primarily by its intended use.[105] General clauses have already been recommended outside the area of product and AI liability.[106] For instance, Art. 5:101 of the Principles of European Tort Law (PETL) contains a general clause covering all kind of "abnormally dangerous activities". Admittedly, general clauses also pose some challenges, particularly in terms of legal certainty and predictability.[107] However, in the context of product liability, their advantages in terms of flexibility seem to outweigh these disadvantages. The defect-based liability regime already forces manufacturers to carefully assess the risks of their products in order to predict

[101] For this example cf. MELINDA F. LOHMANN, "Roboter als Wundertüten – eine zivilrechtliche Haftungsanalyse" *in Aktuelle Juristische Praxis* 2/2017, 152-162, at p. 161.
[102] Cf. JOSEF ESSER, *Grundlagen und Entwicklung der Gefährdungshaftung*, C.H. Beck, 1969, at pp. 90 et seq.; HERBERT ZECH, "Liability for AI: public policy considerations" *in ERA Forum* 2021, 147-158, at p. 153.
[103] Cf. KARL LARENZ/CLAUS-WILHELM CANARIS, *Lehrbuch des Schuldrechts II/2*, C.H. Beck, 1994, at p. 607.
[104] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 404 et seq.
[105] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 399 et seq.
[106] Examples: HEIN KÖTZ, "Haftung für besondere Gefahr" *in Archiv für die civilistische Praxis* 170 (1970), 1-41, at pp. 19 et seq.; ERWIN DEUTSCH, "Methode und Konzept der Gefährdungshaftung" *in Versicherungsrecht* 1971, 1-6, at pp. 4 et seq.; HERBERT ZECH, "Gefährdungshaftung und neue Technologien" *in Juristenzeitung* 68 (2013), 21-29, at pp. 26 et seq.
[107] KARL LARENZ/CLAUS-WILHELM CANARIS, *Lehrbuch des Schuldrechts II/2*, C.H. Beck, 1994, at pp. 601 et seq.

whether courts might find them defective. The additional uncertainty created by the proposed regime seems manageable. Moreover, it is possible to supplement the general clause with guidelines to give judges more guidance, for example by providing a list of cases where strict liability should or should not apply.[108]

Truly strict product liability should not be limited to AI-based products: Other products may also be particularly dangerous, for example in the medical field. However, it seems that in the context of AI, it will be particularly common to encounter situations where damage is not caused by the defect of a product, but by its particular risk. As explained above, the ability of AI systems to learn and act more and more independently will lead to more and more cases, where there is no reasonable alternative design or where the damage is caused not by a defect but by autonomous behaviour. Here too, the autonomous vehicle, which avoids many accidents, but which can also cause serious damage, can serve as an example.[109] For this reason, strict product liability is likely to play its most important role in the context of AI.

## 2.3. Justification of *manufacturers*' truly strict liability

Product liability concerns manufacturers and other stakeholders in the value chain of a product or its components (Art. 7 of the PLD Proposal). The liability of the *users* of products is generally not addressed. Therefore, the introduction of a general clause of strict product liability would primarily concern manufacturers. The European Parliament, on the contrary, suggested in its 2020 Recommendation to impose strict liability for high-risk AI systems not only on the so called "backend operator" – who often overlaps with the manufacturer – but also on the "frontend operator" – who frequently corresponds to the commercial user.[110]

In principle, strict liability for particularly dangerous products should lie with the manufacturer and not with the commercial user.[111] Firstly, as *Wagner* pointed out, "it is necessary to target the party that still exercises some control over the digital system".[112] As seen above, ML leads to a loss of control for manufacturers. However, through the choice of algorithms and training data, they typically still have more influence than users.[113] The degree of user control varies

[108] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 399 et seq.
[109] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 410 et seq.
[110] Cf. HERBERT ZECH, "Liability for AI: public policy considerations" *in ERA Forum* 2021, 147-158, at p. 155. The user, however, must have a degree of control over the risk of the AI System, to qualify as "operator".
[111] GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at pp. 734 et seq.; HERBERT ZECH, "Liability for AI: public policy considerations" *in ERA Forum* 2021, 147-158, at p. 155; ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 373 et seq.; according to PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 30 strict liability should lie on professional users *and* manufacturers.
[112] GERHARD WAGNER, "Liability Rules for the Digital Age" *in Journal of European Tort Law* 13(3) (2022), 191-243, at pp. 196.
[113] GERHARD WAGNER, "Liability Rules for the Digital Age" *in Journal of European Tort Law* 13(3) (2022), 191-243, at pp. 196; HERBERT ZECH, "Liability for AI: public policy considerations" *in ERA Forum* 2021, 147-158, at p. 154 et seq.

depending on the product in question. In case of highly automated AI systems, users only need to activate the product and trust it to make sound decisions. In addition, the manufacturer is better placed to do risk research and is likely to respond better to the pressure to innovate created by strict liability.[114] Users who, exceptionally, exercise greater control – for example, by providing training data to modify the product – may be considered as manufacturers under the PLD (cf. Art. 7(4) of the PLD Proposal).[115] Furthermore, as mentioned above, manufacturers can offset liability costs by increasing prices.[116] Thus, indirectly, users also pay their share of liability costs in case of stricter liability of manufacturers. Admittedly, there is a risk that strict product liability will lead to excessive activity on the part of users, who will then be insured against all product risks.[117] However, it is conceivable that manufacturers will respond to different user risks, for example by integrating "pay-per-use" models into their business concepts.[118]

A more significant problem with limiting strict liability to manufacturers may be that victims could find it difficult to enforce their claims against these defendants: For example, a pedestrian may pass a "smart" construction site and be injured by an autonomous machine. It should be easy for the victim to identify and sue the machine's user.[119] The machine's manufacturer, however, may be more difficult to identify. The 1985 PLD already provides some remedies for such enforcement risks: According to Art. 3(3) of the PLD, where the producer of the product cannot be identified, suppliers are treated as producers unless they inform the injured person, within a reasonable time, of the identity of the producer or of the person who supplied them with the product. *Koziol* referred to this form of liability as "supplementary liability".[120] Suppliers' product liability is based not so much on the idea that they are responsible for a product's *damage risk* but rather on the consideration that they have to bear some *enforcement risks*: Suppliers are generally better placed than the victim to identify the manufacturer.[121] Similar considerations apply when it comes to importers (Art. 3(2) of the PLD)[122] and apparent producers (Art. 3(1) of the PLD)[123]. These economic operators may not be able to control the safety of a product in a way that would justify their ultimate liability. However, since they can identify the manufacturers and verify their solvency and location, it seems appropriate to make them pay the victim and then refer them to their recourse against

[114] Cf. DIMITRIOS LINARDATOS, *Autonome und vernetzte Aktanten im Zivilrecht*, Mohr Siebeck, 2021, at p. 323.
[115] Cf. ANN-KRISTIN MAYRHOFER, "Produkthaftungsrechtliche Verantwortlichkeit des ‚Trainer-Nutzers' von KI-Systemen" *in Recht Digital* 2023, 20-26.
[116] GERHARD WAGNER, "Verantwortlichkeit im Zeichen digitaler Techniken" *in Versicherungsrecht* 2020, 717-741, at pp. 735.
[117] Cf. STEVEN SHAVELL, *Foundations of economic analysis of law,* Harvard University Press, 2004, at pp. 202 et seq. The level of *care* can generally be influenced by defenses of contributory negligences (loc. cit.).
[118] Cf. GERHARD WAGNER, "Produkthaftung für autonome Systeme" *in Archiv für die civilistische Praxis* 217 (2017), 707-765, at p. 765 who mentions Carsharing as an example.
[119] Cf. the Explanation of the European Parliament's 2020 Recommendation, unter 10.: "the operator will be in many cases the first visible contact point for the affected person".
[120] HELMUT KOZIOL, "Die Sicherstellungshaftung" *in Archiv für die civilistische Praxis* 119 (2019), 376-419.
[121] HELMUT KOZIOL, "Die Sicherstellungshaftung" *in Archiv für die civilistische Praxis* 119 (2019), 376-419, at pp. 386 et seq.
[122] HELMUT KOZIOL, "Die Sicherstellungshaftung" *in Archiv für die civilistische Praxis* 119 (2019), 376-419, at pp. 385 et seq.
[123] For details and critique cf. HELMUT KOZIOL, "Die Sicherstellungshaftung" *in Archiv für die civilistische Praxis* 119 (2019), 376-419, at pp. 385 et seq.

the manufacturer.[124] As explained above, it is the manufacturer who should ultimately bear the damage costs. The PLD Proposal extends supplementary liability to "authorised representatives", "fulfilment service providers" and "online platforms" (Art. 7 of the PLD Proposal).[125] It is conceivable to extend this idea further and impose similar obligations on commercial users. Within the limits of this article, which focuses on strict liability, the concept of supplementary liability cannot be discussed in detail. In general, it seems that it can fill some remaining gaps in manufacturers' liability.[126]

## 3. Outlook: Follow-on questions of a "two track" solution of product liability

The aim of this article was to lay the foundations for a general clause of strict product liability. Such a new regime should not replace the existing defect-based approach, but complement it. Of course, if such a "two track" solution is introduced, some follow-on questions may have to be answered: Currently, manufacturers are usually exempt from liability if the state of scientific and technical knowledge was not such as to enable the defect to be discovered (development risk defence, cf. Art. 7(e) of the PLD, Art. 10(e) of the PLD Proposal).[127] It may also be appropriate to restrict strict product liability to "foreseeable" risks (cf. Art. 5:101(2)(a) of the PETL).[128] In order to limit the "chilling effect" of strict liability, one might also consider potential liability caps.[129] Such caps could take into account the staff and the turnover of manufacturers to provide particular relief to SME.[130] Another issue to be considered is how to regulate burden of proof.[131] Truly strict liability significantly reduces the problems of uncertainty, but does not eliminate them completely. In some cases, it could be unclear whether a particular risk has materialised in the concrete damage.[132] Last but not least, one may think about insurance rules. The European Parliament, for example, in its 2020 Recommendation, proposed the introduction of compulsory liability insurance.[133] According to *Hacker* SME should be eligible to

[124] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 149 et seq.
[125] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at p. 436. The text of the provisional agreement maintains the potential liability of these economic operators while modifying some of the details.
[126] For details cf. ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 434 et seq.
[127] Under the 1985 PLD, Member States can exclude this defence in their legislation (Art. 15(1)(b) of the PLD). The European Commission's PLD Proposal does not provide for this possibility. However, according to the text of the provisional agreement, Member States are allowed to derogate from the defence if some conditions are met (Art. 15).
[128] Cf. ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 412 et seq. where it is proposed to provide for a restricted version of the development risk clause.
[129] PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 30.
[130] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 411 et seq.
[131] ANN-KRISTIN MAYRHOFER, *Außervertragliche Haftung für fremde Autonomie*, Mohr Siebeck, 2023, at pp. 419 et seq. where some solutions are discussed.
[132] HERBERT ZECH, "Liability for AI: public policy considerations" *in ERA Forum* 2021, 147-158, at p. 152 et seq.
[133] Cf. Art. 4(4) of the requested Proposal for a Regulation, cf. equally GERALD SPINDLER, "Neue Haftungsregelungen für autonome Systeme?" *in Juristenzeitung* 77 (2022), 793-852, at p. 799.

subsidised insurance.[134] These follow-on questions are not intended to be answered in this article. Rather, they should invite further discussion on truly strict product liability.

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[134] PHILIPP HACKER, "The European AI liability directives – Critique of a half-hearted approach and lessons for the future" *in Computer Law & Security Review* 51 (2023), 105871, at p. 31.

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