

Open-Source Hardware in the light of European Product Liability Law

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This paper is based on an interdisciplinary research project funded by dtec.bw – Digitalization and Technology Research Center of the Bundeswehr. dtec.bw is financed by the European Union – NextGenerationEU

Abstract. *The article will outline the provisions of the German ProdHaftG concerning OSH. It will shortly explain the key points of liability under the German Product Liability Act. Special focus will be given to the EU Product Liability Directive adopted in 2024 which will replace the Product Liability Directive from 1985. The new directive, that the German legislator must implement in national law, brings a few changes, and aims at adapting the directive to the digital age. Of significant interest is recital 14 of the directive, which states that the new directive should not apply to “[...] free and open-source software developed or supplied outside the course of a commercial activity.” OSH, however, is not explicitly excluded from the scope of the new product liability directive. Therefore, the question arises as to whether this statutory privilege clause for Open-Source Software should also apply to OSH since both are developed or supplied for non-commercial purposes.*

Keywords: Product Liability, German Produkthaftungsgesetz (ProdHaftG), European Product Liability Directive.

1 Introduction

Open-Source Hardware (OSH) can be considered a novel method of developing hardware by applying Open-Source principles. Whereas in conventional production responsibility lies solely with a single entity or a few individuals, Open-Source designs are made public, enabling anyone to study, modify and implement them.¹ Therefore, anyone with technical interest and knowledge can alter the open designs for their own purposes and create a new product.

OSH takes a different approach to conventional production. To benefit from the advantages of iterative processes, OSH designs shall be published at an early stage, even if the design is not fully completed. It is a beneficial effect of the common iteration of

¹ According to the OSH definition of Open-Source Hardware Association (OSHW) Open-Source Hardware is hardware whose design is made publicly available so that anyone can study, modify, distribute, make, and sell the design or hardware based on that design, <https://www.oshwa.org/definition/>.

the OSH design that the knowledge of many can be used to complete or even improve the OSH design.

However, many OSH designers are cautious about publishing designs, that are not completed and maybe thus not flawless. They are often concerned about liability in the case that the OSH design causes damage. Within the OSH community there are great uncertainties concerning legal issues and liability especially product liability. The statutory product liability is particularly relevant in cases involving sophisticated production chains which are characterised by the collaboration of many people and institutions. Moreover, there is usually no contractual link between the OSH designer and the user of the final product (*Müller/Haase*, InTeR 2017, 124).

The German product liability is regulated in the Act on Liability for Defective Products (ProdHaftG). The ProdHaftG implements the regulations of the European Directive of the European Parliament and of the Council on Liability for Defective Products (Product Liability Directive). Therefore, the legal definition of a defective product and the rules on liability are equal in the European Union.

According to Art. 2 of the Product Liability Directive from 1985, products are only movable and physical objects as well as electricity. This led to the view that software could only be considered a product if it was embodied on a data carrier (e.g. a disc). Especially virtual electronic products fell outside of the directive's scope. Hence, for many years, it was unclear whether software should be considered a product in the sense of the Product Liability Directive (*Riehm/Meier*, EuCML 2019, 161, 162; *Müller/Haase*, InTeR 2017, 124, 127; *MüKoBGB/Wagner*, ProdHaftG § 2 Rn. 21 ff.; *Müller-Hengstenberg/Kirn*, MMR 2021, 376, 379; *NK-ProdR/Taeger*, ProdHaftG § 2 Rn. 18 ff.). Today software is a component of a litany of products, therefore updating the Product Liability Directive was inevitable. But not only the digitalisation urged the European legislator to adapt the Product Liability Directive and to regulate liability for software and AI-defects. The progression towards a circular economy and increasing globalisation raised the question of who is liable if a modified product is defect and who shall be held liable if the manufacturer is not located in the EU.

This article briefly describes the background of the Product Liability Directive (2) and gives an overview of the German ProdHaftG (3). The liability provisions under the ProdHaftG relating to OSH will then be outlined (4). It concludes with an outlook on the new regulation of the revised Product Liability Directive regarding the prospects of a circular economy (5).

2 The European Product Liability Directive

The European Product Liability Directive dates back to 1985 and was implemented into German law in 1989 through the German ProdHaftG. Since then, not only the way products are manufactured, distributed, and operated has changed significantly, but also

the products themselves. Advancing digitalisation has altered both production processes as well as the manufactured products. The Product Liability Directive on the other hand did not change for almost 40 years and as the variety of products increased, it became clear that the scope of the old directive was too narrow, because products of the digitalised age did not fit within (*Riehm/Meier*, EuCML 2019, 161, 162).

In September 2022, the European Commission published a draft for a new Product Liability Directive. The European Commission, European Parliament and the Council agreed on the final text of the Directive in December 2023 and on the 12th of March 2024 the European Parliament adopted the new Product Liability Directive (European Parliament, press release, Deal to better protect consumers from damages caused by defective products). The new Product Liability Directive will enter into force on the twentieth day after its publication in the EU Official Journal (European Parliament, press release, Defective products: revamped rules to better protect consumers from damages). The member states need to implement the Directive into national law within 24 months. It is expected that the new regulation will come into force by mid-2026 in Germany (*Förster/Gashi*, Clyde & Co. 2024).

The new Product Liability Directive leads to a far-reaching revision of product liability regulation in Europe (link to the adopted version: https://www.europarl.europa.eu/doceo/document/TA-9-2024-0132_EN.html). In particular, the scope of the directive has been extended by including software, digital production documents (e.g. CAD files) and raw materials, Art. 4 No. 1 Product Liability Directive.

3 Overview of the German ProdHaftG

The Product Liability regulation aims to harmonise the law within the EU and align national regulations on product liability. The intention is to prevent distortions on the European internal market and to avoid impairments of the free movement of goods. Furthermore, the ProdHaftG intends to distribute the risks of modern productions fairly among all parties. It shall ensure a high level of consumer protection (*MüKoBGB/Wagner*, Einl. ProdHaftG Rn. 16 ff.).

According to § 1 para. 1 s. 1 ProdHaftG an injured person can claim material and immaterial damages from the manufacturer of a defective product if this product has damaged property or injured a person. The responsibility is solely based on the commercialisation of the defective product, it is not necessary that the manufacturer has acted intentionally or negligently. The behaviour and the culpability of the manufacturer will however be considered within the exceptions to liability in § 1 para. 2 No. 1-5 ProdHaftG– for example if the manufacturer did not place the product on the market or if the defect was not recognisable according to the state of scientific and technical knowledge. The ProdHaftG therefore regulates a type of strict liability as initially the claim does not depend on a fault of the manufacturer but just on the defectiveness of the product.

If a defective product causes damage, § 1 para. 1 s. 1 ProdHaftG is not the only basis for a claim. There may also be liability based on contract, as well as tort law or the producer liability that was developed by German case law. As already mentioned, OSH is typically associated with complex production chains. This means that anyone can alter the product design, but also that anyone can download the design file and build the product. Thus, the creator of the product design and the final manufacturer of the product are usually separate entities and may not have had any personal contact. Consequently, there is often no contractual connection between these parties. Moreover, general tort law claims under § 823 para. 1 BGB do not play an essential role, as it is difficult to prove an intentional or negligent behaviour of the other party. For these types of cases, German case law has developed the so-called producer liability that shifts the burden of proof to the manufacturer. The producer liability is not a strict liability and is only applicable if the manufacturer has intentionally or negligently infringed a duty to ensure the safety of the product. If the manufacturer infringes a duty to ensure the safety of the product, the product will be generally also defective pursuant to the ProdHaftG because similar requirements apply. Therefore, claims under the producer liability and claims under the ProdHaftG are likely to have the same outcome (BeckOGK/Goehl, ProdHaftG § 3 Rn. 1). This article focuses on the ProdHaftG, the producer liability will not be examined.

4 OSH and Product Liability

A successful claim under the ProdHaftG requires a defective product. First, it is necessary to examine what constitutes a product in the context of OSH under the current ProdHaftG and what modifications the updated Product Liability Directive will entail (4.1). Second, it is essential to define when a product is defective according to § 3 ProdHaftG (4.2). Moreover, it must be examined who can be regarded as manufacturer in the context of OSH (4.3). The ProdHaftG constitutes a strict liability, however, there are exceptions to liability according to § 1 para. 2 No. 1-5 ProdHaftG which will be briefly described (4.4).

4.1 Product, § 2 ProdHaftG

According to § 2 ProdHaftG a product *“is any movable, even if incorporated into another movable or into an immovable, as well as electricity.”* It is therefore clear that a physical product that was manufactured based on an OSH design falls under § 2 ProdHaftG. If the OSH product is defective, the manufacturer may owe the injured person compensation in accordance with the ProdHaftG.

Questions arise, however, when the product was based on a defective OSH design. Can also the design file be considered a product according to § 2 ProdHaftG even if it is not embodied in a movable or immovable thing?

Some legal scholars argue that digital files can only be regarded as products under § 2 ProdHaftG if they are embodied in a tangible medium such as a CD or USB-stick

(Wende, RDt 2021, 341, 344 Rn. 21; BeckOK/Förster, ProdHaftG § 2 Rn. 22; Oechsler, NJW 2018, 1569, 1570). However, there are many legal scholars who consider digital files to be products even if they are offered online as a download (Borges/Keil/Big Data-HdB/Borges, § 7 Rn. 188; MüKoBGB/Wagner, ProdHaftG § 2 Rn. 22; Zech, NJW 2022, 502, 505 Rn. 29; NK-ProdR/Taeger, ProdHaftG § 2 Rn. 28; NK-BGB/Katzenmeier, ProdHaftG § 2 Rn. 3). There are convincing reasons in favour of the latter. Digital files are produced and traded in similar manner to physical objects and can threaten people's rights and property in the same way as physical objects. Therefore, digital files should be seen as products regardless of whether they are embodied. Following the latter view, a CAD file would be considered a product and in the event of a defect the designer of that file would face claims under the ProdHaftG (MüKoBGB/Wagner, ProdHaftG § 2 Rn. 28). This would make the designer of the file the producer of a component part. He or she would therefore only be liable if the component part is defective according to § 3 ProdHaftG (MüKoBGB/Wagner, ProdHaftG § 2 Rn. 28).

There are already convincing reasons in favour of treating design files as products in the sense of § 2 ProdHaftG. The new Product Liability Directive clearly defines that digital manufacturing files (e.g. CAD files) are products. This clarification brings legal certainty and makes it easier for those seeking damages.

4.2 Defective product, § 3 ProdHaftG

§ 3 ProdHaftG states that *“a product has a defect when it does not provide the safety which one is entitled to expect taking particularly into account its presentation, the use to which it could reasonably be expected that it would be put, [and] the time when it was put into circulation.”*

The level of safety that can be demanded depends on the reasonable expectations of the public. It is not reasonable to expect that the product is free of all kinds of dangers (NK-BGB/Katzenmeier, ProdHaftG § 3 Rn. 3). The costs of the safety measures to be taken must be in proportion to their benefits. In addition, they must be objectively necessary to avoid the danger and be reasonable by objective standards. What is legally required depends on the probability and gravity of potential harm. An even higher safety standard can be expected if there is a threat to important goods such as life and health (MüKoBGB/Wagner, ProdHaftG § 3 Rn. 6 ff.).

As mentioned above the idea behind OSH is to publish designs at an early, even incomplete stage so that many people – amateurs and experts – can be involved in the process. Therefore, there are rising concerns about the liability as it is more likely that an unfinished design can cause damage. OSH designs are freely adjustable, and anyone can basically "lend a hand" to modify the OSH designs or adapt them to their needs. This means that the construction of OSH designs is not just the responsibility of a single designer. Rather, an OSH design is the result of joint advancement and iterative improvement (Kuschel/Haller, Haftungsrisiken im Kontext von Open Source Hardware,

p. 155). This means that the safety that can be expected mainly depends on the description of the design file. If it clearly indicates that the design is ready to be build, a safe product can be expected. If it explicitly states, however, that the design is not completed and still needs modification, the manufacturer cannot expect a safe product.

4.3 Manufacturer of the product, § 4 ProdHaftG

According to the current version of the ProdHaftG, the manufacturer of an OSH product falls under the definition of the producer in § 4 para. 1 s. 1 ProdHaftG if he or she produces an OSH product. If the OSH product is defective and damage occurs because of the defect, the injured parties can demand compensation from the manufacturer in accordance with § 1 para. 1 s. 1 ProdHaftG. This will not change with the implementation of the new Product Liability Directive.

The designer who creates the OSH design is producer according to § 4 ProdHaftG at least if the CAD file is embodied in a data carrier (*Oechsler*, NJW 2018, 1569, 1572). If the CAD file is transferred online, then it cannot be assumed without doubt that the CAD file is to be regarded as a product within the meaning of the Product Liability Act due to the lack of embodiment. Several good reasons speak in favour of this, as mentioned above.

Since digital manufacturing files are indisputably covered by the product concept under the new Product Liability Directive, with the implementation of the new Product Liability Directive into national law it will be beyond any doubt, that creators of CAD files or other digital design files are also generally liable under the Product Liability Act.

4.4 Exceptions of liability, § 1 para. 2 No. 1-5 ProdHaftG

There are five exceptions stated in the ProdHaftG that shield producers from liability. According to § 1 para. 2 “*The producer’s liability obligation is excluded if*

- *the producer did not put the product into circulation [No. 1],*
- *under the circumstances it can be assumed that the defect [that] caused the damage did not exist at the time when the producer put the product into circulation [No. 2],*
- *the product was neither manufactured by the producer for sale or any other form of distribution for economic purpose not manufactured or distributed by the producer in the course of his or her professional activity [No. 3],*
- *the defect is due to compliance of the product with mandatory regulations at the time when the producer put the product into circulation [No. 4] or*
- *the state of scientific and technical knowledge at the time when the producer put the product into circulation was not such as to enable the defect to be discovered [No. 5].”*

In the following, only the most relevant exceptions for the OSH sector will be discussed. Those are the involuntary placing on the market (No. 1), a distribution for non-economic purposes (No. 3), and the compliance with the state of scientific and technical knowledge (No. 5).

No voluntary act of circulation, § 1 para. 2 No. 1 ProdHaftG. The liability obligation under the ProdHaftG is excluded if the producer did not bring the product into circulation.

According to the case law of the European Court of Justice (ECJ), a product is placed on the market when, the manufacturer has done everything necessary to complete the manufacturing process and the product is offered to the public in a ready-to-use condition (EuGH Urt. v. 9.2.2006 – C-127/04 Rn. 32, NJW 2006, 825, 826 – Declan O’Byrne/Sanofi MSD Ltd; NK-ProdR/Ehring, ProdHaftG § 1 Rn. 52). The product is not placed on the market if the product has left the manufacturer’s sphere of control without the manufacturer’s intention. Software is placed on the market if it can be downloaded irrespective of an actual download. It is sufficient that the possibility of downloading the software exists (NK-ProdR/Ehring, ProdHaftG § 1 Rn. 60).

Article 11 of the new Product Liability Directive regulates a similar exemption from liability in the case that the manufacturer did not place the product on the market. According to recital 50 of the new Product Liability Directive *“the moment of placing on the market or putting into service is normally the moment when a product leaves the control of the manufacturer [...]”*. The new Product Liability Directive legally defines “placing on the market in § 4 No. 8 Product Liability Directive as *“Placing on the market’ means the first making available of a product on the Union market.”*

In the OSH context, *placing on the market* is difficult to determine as it is an intention of this concept that unfinished designs are uploaded that are not necessarily ready for use. It is possible that the development of the “manufacturing process” is not completed when the design is published. However, the legal definition in § 4 No. 8 of the new Product Liability Directive states that it is sufficient that the product is made available to the Union market regardless of whether the product is completed and ready to use in the manufacturer’s view.

No distribution for economic purposes, § 1 para. 2 No. 3 ProdHaftG. In the OSH context the exemption of § 1 para. 2 No. 3 ProdHaftG is of particular importance. § 1 para. 2 No. 3 ProdHaftG regulates an exemption of the liability if the *“product was neither manufactured by the producer for sale or any other form of distribution for economic purpose nor manufactured or distributed by the producer in the course of his or her professional activity [...]”*. This kind of exemption is also regulated in the new Product Liability Directive. According to recital 26 Product Liability Directive the directive does only *“apply to products placed on the market or, where relevant, put into service in the course of a commercial activity, whether in return for payment or free of*

charge, for example products supplied in the context of a sponsoring campaign or products manufactured for the provision of a service financed by public funds [...].”

This exemption follows the approach of a fair distribution of risk. For amateur designers acting for non-commercial purposes this exemption means that they do not have to fear claims under the ProdHaftG. However, it should be noted that the exemption does not apply if the project is financed with public funds – which is often the case with OSH projects.

Corresponds to the state of scientific and technical knowledge, § 1 para. 2 No. 5 ProdHaftG. According to § 1 para. 2 No. 5 ProdHaftG the producer’s liability is excluded if *“the state of scientific and technical knowledge at the time when the producer put the product into circulation was not such as to enable the defect to be discovered.”* This refers to the exclusion of liability for development risks (BeckOGK/Seibl, ProdHaftG § 1 Rn. 119). The manufacturer should not be liable for development risks that could not have been foreseen at the time the product was placed on the market (BT-Drs. 11/2447, S. 15).

The decisive factor is that the defect was unavoidable. This must be assessed objectively according to the state of scientific and technical knowledge (NK-BGB/Katzenmeier, ProdHaftG § 1 Rn. 21). According to the explanatory memorandum to the ProdHaftG, the state of scientific and technical knowledge comprises the expertise available in the field of science and technology, i.e. the sum of generally recognised and generally available knowledge and techniques (BT-Drs. 11/2447, S. 15). The error is considered unavoidable if the potential danger of the product could not have been discovered by anyone because the knowledge was not yet available (instead of all MüKoBGB/Wagner, ProdHaftG § 1 Rn. 56 ff.).

Even scientific minority opinions are part of the "state of scientific and technical knowledge" if they meet the minimum requirements for scientific work, i.e. are theoretically plausible, scientifically comprehensible, and practically proven by tests and experiments (MüKoBGB/Wagner, ProdHaftG § 1 Rn. 59; NK-BGB/Katzenmeier, ProdHaftG § 1 Rn. 21). The manufacturer must also investigate a minority opinion, if the potential risk is high and severe (MüKoBGB/Wagner, ProdHaftG § 1 Rn. 59).

The exemption is only relevant if the product is defective according to § 3 ProdHaftG, i.e. does not provide the safety which one can expect. The product is defective if it does not fulfil the justified safety expectations of the public at the time it was placed on the market. In contrast to the concept of defect, proof of exemption in accordance with § 1 para. 2 No. 5 ProdHaftG concerns the limits of human cognition at the time the product was placed on the market and not the limits of technical possibilities (MüKoBGB/Wagner, ProdHaftG § 1 Rn. 52). If an originally faultless product was placed on the market, the further development of the state of the art in science and technology does not lead to the product subsequently being qualified as defective (BT-Drs. 11/2447, S. 16).

5 Product Liability and the prospects of a circular economy

OSH can be seen as a step towards a circular economy. Following the European Parliament's definition "circular economy" is a model of production and consumption, which involves sharing, leasing, repairing, refurbishing, and recycling existing materials and products as long as possible (European Parliament, Circular economy: definition, importance and benefits). The aim is to extend the lifecycle of products and product components to achieve better resource efficiency.

This raises important questions concerning the product liability as who can be considered a liable economic operator when an existing product is substantially modified, and how to ensure the transition towards a circular economy and foster the sharing of knowledge, without hindering this by imposing too strict liability regulations.

5.1 Substantial modifications of the product

OSH is supposed to play an important role in achieving more sustainability. Consequently, some OSH designs involve the reuse of existing products to create new products. Therefore, Art. 8 No. 2 of the new Product Liability Directive is crucial in the context of OSH. According to Art. 8 No. 2 Product Liability Directive "*any natural or legal person that substantially modifies a product outside the manufacturer's control and thereafter makes it available on the market or puts it into service shall be considered to be a manufacturer of that product for the purposes of [Art. 8] paragraph 1.*" A person that modifies an existing product is therefore regarded as the manufacturer of the new product if the change is substantial and if the alteration falls outside the control of the original manufacturer.

Recital 39 of the new Product Liability Directive points out that products are designed to be more durable, reusable, repairable and upgradable due to the transition from a linear to a circular economy. A product should be considered a new product if it is substantially modified outside the control of the original manufacturer. The person who has substantially altered the product is then to be held liable as the manufacturer of the altered product. Since the aim of the Product Liability Directive is to distribute risks fairly, the manufacturer of the substantially altered product is to be exempted from liability if he or she can prove that the damage was caused by a part of the product that is not affected by the alteration. Repairs or other work without significant changes are still not subject to liability under the Product Liability Directive.

5.2 Privilege for Open-Source Software (OSS)

As innovation commonly moves faster than the legislator, the new Product Liability Directive is facing challenges already. While it must ensure that people who are harmed by defective products can easily and effectively claim damages, the new directive must not hinder innovation and leave room for companies and individuals to pursue ideas and launch new products. This will lead to a great balancing act between general

consumer rights and the aim for innovation. To foster trustworthy and reliable innovation it is essential on the one side, to guarantee security from products but on the other hand, it must be assured that the liability rules are reasonable and not too strict.

The new Product Liability Directive aims to balance those opposing interests and addresses the need for sustainable production and a circular economy to which OSH can make a decisive contribution. For instance, the new directive states in recital 14 that the directive does not apply to OSS not to hamper innovation and research. However, the new product liability directive does not mention OSH.

It is unclear why OSH is not explicitly excluded from the scope of the new product liability directive. Not only the idea and approach of OSH is similar to OSS but also the spirit behind it and the results. Both OSS and OSH provide opportunities that are unlikely to happen in the proprietary economy. For instance, due to open source, users can modify code or designs for their own purposes, thereby improving it not only for their own benefit but also in the interest of the community. In addition, both OSS and OSH can lead to economic growth, greater competitiveness, innovation, and job creation (*Moritz/Redlich/Buxbaum-Conradi*, Einführung: Wie Fab Cities zu einer nachhaltigeren Entwicklung beitragen, p. 4). Shared Open-Source components can be produced in highly optimised processes as it is possible to agree on common components that can be reused (*Blind et al.*, The impact of Open-Source Software and Hardware on technological independence, competitiveness, and innovation in the EU economy). OSH allows products to be produced locally, eliminating long transport routes (*Stengel*, Digitale Produktion und Postkapitalismus, 2016, p. 78). Therefore, OSH can play an important role in achieving a circular economy and thus leading to greater sustainability.

Considering these similarities and the positive societal impact of OSH it seems that the idea of privileging OSS should also apply to free OSH. The reasoning behind the privilege in recital 14 works perfectly for OSH. Thus, granting privileges to OSH would be a good way to balance consumer rights with innovation and economic growth. However, in the light of the legislative wording – Recital 14 explicitly privileges OSS only and Article 4 para. 1 Product Liability Directive distinguishes clearly between software and digital manufacturing files – it remains to be seen whether the privilege will be applied to OSH.

6 Conclusion

The new Product Liability Directive clarifies the legal situation for software and digital files and is therefore a useful and overdue legislative act. Overall, the changes are also appropriate for ensuring a fair distribution of risks between the various actors and allowing for innovation.

However, there are still unanswered questions regarding OSH, in particular whether the legal privilege of OSS also applies to OSH. With the implementation of the new Product Liability Directive, it must be awaited whether recital 14 will also be applied to OSH by the courts or legal scholars, with the ECJ having the final say. Another interesting point is that OSH is suitable for the publication of "unfinished" designs, although it is not yet clear what consequences this has for product liability, namely at

what point the product is to be considered placed on the market or how to decide whether it is defective.

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