Towards a multicentric quality framework for legal information portals: An application to the DACH region

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ABSTRACT

Legal Information Portals (LIPs) are central information offerings that give various user groups digital access to the law, including legislation, legal acts, or even court decisions. LIPs could provide access to complex legal content in a user-friendly yet accurate way, while exploiting the benefits of open data to enable easy access to legal content for other applications. However, the development of LIPs traditionally adheres to formal legal criteria, leaving users out in the cold. As a result, even the most modern LIPs fall short of providing a user-centric offering. To address this issue, we present a multicentric quality framework to help providers develop and evaluate LIPs by assessing their data quality, data portability, and usability. We apply the framework to the LIPs of Germany, Austria, and Switzerland (the DACH region: D: Deutschland [Germany], A: Austria, CH: Confoederatio Helvetica [Switzerland]) to illustrate its use and identify quality differences between their current systems. Our quality framework for LIPs helps decision-makers better understand and exploit the possibilities for the dissemination of legal information as part of their open justice initiatives. We contribute to the literature by complementing previous conceptual works with a concrete, comprehensive measurement schema that also serves as a basis for assessing user requirements and data portability configurations in other domains with high content complexity.

1. Introduction

Digital transformation projects in the public sector frequently do not fully utilise state-of-the-art digital technologies, which has led to undesirable outcomes in terms of cost, quality, and adoption (Clarke, 2020). Research has identified several causes for this, including a lack of knowledge about state-of-the-art technologies (Baheer, Lamas, & Sousa, 2020), organisational barriers, and a lack of management support (Tangi, Janssen, Benedetti, & Noci, 2021). In general, providing digital government services remains challenging (Barcevičius et al., 2019; Eom & Lee, 2022).

These challenges are also apparent in the constitutional responsibility of states to inform citizens about current legislation through suitable channels, which is meant to facilitate access to justice. Most states have developed Legal Information Portals (LIPs) to fulfil this requirement (Mitee, 2017). LIPs are official information offerings that give various users groups open access to the laws of a state, including legal acts or court decisions (Eichel et al., 2022). Beyond the publication of legal content, LIPs can also open new economic perspectives based on

open data that allows for an automated exchange of legal data with other IT systems (Publications Office of the European Union, 2017, II.6. f). The further development of LIPs accompanies increased attempts to introduce e-justice platforms to digitise court processes (Reiling & Contini, 2022). Another advantage is that LIPs facilitate easier access to legal data for a broader audience beyond official members of the legal profession (Peruginelli, 2016; Peruginelli, Conti, & Fioravanti, 2021).

However, while LIPs offer various advantages, their development involves uncertainty and complexity for public organisations that must determine how best to provide access to a vast amount of legal content while presenting it in an accurate and user-friendly way and also considering open data principles in their design. These challenges lead to substantial differences in the current LIP systems as well as unexploited potential for improving or developing new LIPs (Eichel et al., 2022; Mitee, 2017). While modern cloud-based applications, AI-based decision support, open-data ecosystems, and user-centric digital services have rapidly proliferated in many industries in recent years, a look at current implementations reveals that this is not necessarily the case for LIPs (Mitee, 2017) or the judiciary (Reiling & Contini, 2022). On 1

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January 2023, Germany launched a long-awaited website serving as the official record for federal laws (LTO, 2021). While this is certainly a step in the right direction, it is at most a small step, for two reasons. First, despite now having an official electronic record, the new website is not integrated with the existing, more expansive German LIP *Gesetze im Internet*. Therefore, users must still visit two different LIPs with partially overlapping content. Second, although launched in 2023, the new offering does not reflect a user-centric perspective for legal content. This issue is not limited to Germany. After surveying 204 states and jurisdictions, Nishikawa-Pacher and Hamann (2023) found that only 48 offer services that provide at least basic functionality related to availability, searchability, and reusability.

The literature provides multiple frameworks that establish general quality criteria for websites, e-commerce applications, and open data (e. g., Venkatesh, Hoehle, & Aljafari, 2017; Vetrò et al., 2016), though they do not address the specific purpose and characteristics of LIPs. Furthermore, they mainly focus on a single dimension rather than accounting for the quality of the legal data (data quality), data portability (ability to exchange data between multiple platforms or services) and usability (ease of use) simultaneously. In addition, several recent works address the challenges of making legal information available online (e. g., Chang, 2021; Mitee, 2017). These frameworks primarily provide design suggestions or prototypes of network-based approaches for the online dissemination of legal information, but fall short in two aspects. First, their suggestions are laudable but often beyond the reach of individual LIP providers, for instance, by requiring actions from several providers on different levels. Second, they do not allow LIP providers to a) assess their current offering, and b) improve their offering based on its current status.

Building on the three categories of data quality, data portability, and usability, we present a holistic and actionable quality framework to enable public actors to better assess and define their LIPs. We apply the framework to the LIPs of Germany, Austria, and Switzerland (the DACH region: D: Deutschland [Germany], A: Austria, CH: Confoederatio Helvetica [Switzerland]) to illustrate its use and identify the quality differences of each system. The framework helps decision-makers better understand the possibilities of modern LIPs from an overarching, usercentric perspective. We also contribute to research on the requirements and design of other services that make sensitive data available in the public domain.

2. Conceptual background

2.1. Usage and potential of legal information platforms

LIPs are central information offerings that provide access to the law – including legislation, legal acts, or even court decisions – for various user groups (Mitee, 2017, Fig. 1). The term "Legal Information Portal" has emerged (Mast, 2022, p. 61) to characterise the increasing functional range and extended usage context of the systems. Ideally, all legal content would be centralised and available on one LIP as a "one-stop-shop", hence the definition of LIPs as central information offerings. However, that ideal scenario is still far from reality. Therefore, our research focuses on how legal information can be disseminated via LIPs.

The relevance of LIPs is best illustrated by observing the traditional method of finding legal information. Apart from LIPs, laws are commonly accessed either in textbooks or through paid (online or on-premises) databases run by legal publishers. Textbooks are still quite popular for those in the legal sector who are less technologically adept, but they usually only contain selected laws in a certain area of law. For instance, a German textbook about the German Civil Code that only contains the provisions of a few laws often appears on bestseller lists in Germany. The popularity of textbooks might be due in part to the fact that subscriptions to online databases are often very expensive and not every legal practitioner is willing or able to afford them.

While paid databases can be costly, LIPs are usually free of charge.

Table 1
Monthly LIP Accesses in 2021.

LIP	Accesses per Month	Annotation
Austrian LIP	1.2 million[a]	Annual increase of about 500,000 since 2019
German LIP	4.8 million[b]	
Swiss LIP	1.5 million[c]	25% of accesses take place on a mobile device

[a] Austrian Ministry for Digital and Economic Affairs (personal communication, 2022).
[b] German Federal Office of Justice (personal communication, 2022).
[c] Swiss Federal Chancellery (personal communication, 2022).

Compared to books, LIPs have several advantages: they are easily and widely accessible, always up to date, don't require carrying heavy books (which professionals in the legal field are famous for doing), and simple to navigate. Furthermore, when dealing with old cases, practitioners need to determine if a law applies in its current form or whether an older version is applicable. While bookstores and even libraries often do not keep a back catalogue of all previous textbook editions, LIPs may contain all the versions of a law. LIPs can even be useful for people who have access to paid databases, because they allow users to access the information from any device, including personal computers and smartphones. Since LIPs are official and free to use, they are usually accessible more easily via public search engines. In addition to these advantages perhaps the most important benefit from a legal perspective is that users can be certain that LIPs contain official content. Paid databases provided by publisher companies usually disclaim responsibility for displaying the wrong or old wording, but users of LIPs "can" and legally "may" rely on them as an official source. Legal practitioners are even obliged to use and give preference to content from official LIPs over secondary sources to comply with legal due diligence.

Arguably, paid databases can contain much more content than just laws, and in this regard, they are not in competition with LIPs. However, when it comes to the wording of laws and key data about them, LIPs will be increasingly relevant due to the aforementioned reasons. Official usage figures indicate a high and growing relevance of LIPs (Table 1).

Beyond their original mandate of making legal information available electronically over the internet, LIPs offer additional benefits. For example, they can improve public access to the law by contextualising it for users. LIPs are also a building block in international efforts towards "Open Government Data", which aims to make government data available for free to a broader circle of users (Lederer, 2015, p. 41; Richter, 2017; Weber, Laux, & Oertly, 2016, p. 51).

2.2. A classification of user groups

LIP usage can be further illustrated by drawing from Chang's four categories of personas, which access public legal information websites in different ways (Chang, 2021, pp. 226–228) (Fig. 1).

While Chang's personas provide a helpful starting point, a study conducted by the European Union (ELI Taskforce) and our own workshops (Section 3.1) have shown that the key user groups of LIPs can be further defined. The EU study found that 68% of LIP users were professionals, 24% with an academic background, and only 8% were private individuals (ELI Taskforce, 2017, p. 9). Users with a professional background, who therefore fit into category 1 of Chang's framework, include lawyers, civil servants, members of the judiciary, legal publishers, translators, and so forth (ELI Taskforce, 2017, p. 10). Most of the academic user group, which mainly consists of researchers and students (ELI Taskforce, 2017, p. 11), might also be included in category 1 of Chang's framework. Students in the first year(s) of law school may not be very familiar with law or advanced legal online search techniques, and therefore are comparable to Chang's category 3 persona. Also included in category 3 are private individuals (citizens, laypersons) with no general knowledge of law but an interest in specific legal content. Several current initiatives aim to go beyond the mere display of laws and

	Less familiar	More familiar
More familiar	(1) Familiar with law, but might need support with advanced online searching Might include: Attorneys? Paralegals?	(2) Familiar with law and advanced online searching, but might still have needs that could be better supported Might include: Law librarians?
Less familiar	(3) Might need support to understand legal information and advanced online search techniques Might include: Members of the public with little experience with the law?	(4) Familiar with advanced online searching, but might need support to understand legal information Might include: Librarians other than law librarians?

Familiarity with U.S. legal system (vertical axis)

Familiarity with advanced online search techniques (horizontal axis)

Fig. 1. User Personas for Accessing Public Legal Information Websites (Chang, 2021).

provide non-professional users with better access to legal information, for instance, by enabling better monitoring of the real-world implementations and effects of laws (e.g., the Environment and Planning Act or "Omgevingswet" in the Netherlands and its corresponding web platform, www.iplo.nl). However, providing legal content to consumers via LIPs still seems to be in an early stage, since neither the EU study nor other research has provided a meaningful measurement of how and to what extent consumers visit and use LIPs, nor is there – from a legal point of view – sufficient research on how legal information can be delivered to laypersons without producing wrong information. Therefore, in light of the EU study, we have created our framework with professional users in mind (categories 1 and 2). While overarching societal transformations in citizen engagement and coordination processes between legislative bodies and the general public will take place, they require further research and are beyond the scope of our paper.

2.3. Economic and legal drivers for legal information platforms

There are several economic and legal drivers that foster LIPs. Firstly, for individuals consulting the law, the cost of obtaining information tends to be lower using online methods than by accessing print content (Liu, 2004). Secondly, increasing linkage and outreach adds economic value because a digitally accessible legal system opens new markets. This has been explicitly named as a goal of the EU Council (Publications Office of the European Union, 2017, II.6.f). By automatically integrating the official wording with a simple link, external publishers or providers of legal services can make legal information available on their websites for low transaction costs while ensuring access to the current official data (Janssen, Charalabidis, & Zuiderwijk, 2012). This also enables recipients to learn of legislative changes in an automated and timely manner. With globalisation, more and more LIP users may be accessing the systems from abroad. Thirdly, by offering attractive cross-border services, LIPs can create a competitive advantage for countries by enabling them to establish a reputation for having an internationally attractive judicial system, which has long been perceived as a driving economic factor for the international legal services market (Triebel, 2008; Wagner, 2018). Finally, the law dictates that legal content be published via the internet. For example, the member states of the EU are obliged to create barrier-free access to the public portions of their websites or mobile applications (Publications Office of the European Union, 2016). The content should be noticeable, operable, understandable, and "robust" enough to be interpreted by assistive technologies, among other things (Publications Office of the European Union, 2016, Art. 1, 4 and 5).

2.4. Quality criteria for legal information portals

LIPs must present the law in a correct and user-friendly digital form while harnessing the opportunities offered by open data. Below, we present relevant quality criteria for the three related dimensions: 1) data quality, 2) data portability, and 3) usability.

For the first dimension, data quality, a successful implementation cannot only consider the number of data entries but must also fulfil high standards for the quality of the published data (Mertens et al., 2017, p. 39). The literature provides several suggested criteria for determining suitable quality. For instance, Wand and Wang (1996) and Wang and Strong (1996) identify multiple dimensions of data quality, such as accuracy, completeness, and timeliness. Batini, Cappiello, Francalanci, and Maurino (2009) provide an overview of different frameworks and their data quality dimensions. From a legal perspective, Mast (2022) adds data quality criteria for LIPs, including legal certainty, completeness of legal provisions, and the availability of different versions of legislation. The literature also provides the following guidelines regarding the quality of legal data websites: a) websites should be available permanently to ensure reliable access to the law (Heckmann, 1997, p. 132 ff.), b) official channels for the publication of legislation must be unique and distinct from other platforms (Wissenschaftliche Dienste des Deutschen Bundestages, 2009), c) the data must have sufficient detail to fulfil completeness requirements for specific contexts (Mertens et al., 2017, p. 38 ff.), d) websites must be able to handle or link data from different governmental levels (supranational, federal, state, and local), and e) legislative materials, documents, and records must be at least linked, as this content is important for the interpretation of legislation (Möller, 2021, p. 138 ff.). In contrast, insufficient data quality comprises missing as well as redundant or faulty entries, which can lead to inaccurate search results and, eventually, wrong decisions (Mertens et al., 2017, p. 39).

The second dimension of our framework concerns data portability, meaning that data should be able to be seamlessly exchanged between applications and used reciprocally (Shehzad et al., 2021). For data to be legally reused by third parties, it must be published under an open license, ensuring that everyone can a) *freely access, b) use, c) modify, and d) share the data* (Open Knowledge Foundation, 2022). Openly accessible data can generate political and social benefits (e.g., increased transparency), economic benefits (e.g., facilitating new or improved products or services), as well as technological benefits (e.g., easier reuse of data, ability to merge and integrate data) (Janssen et al., 2012). In addition to open data, "linked data" can help facilitate access by other applications to the data stored on LIPs by implementing graphs, which provide information about the relations within a data set (Hitzler, 2021). Combined with the abovementioned principles, we obtain "linked open data" that is sharable, extensible, and easily re-usable (Baker et al., 2011).

Despite early attempts to establish a common format for structured data (e.g., Boer, Hoekstra, Winkels, & van Engers, 2002; Hoekstra, Breuker, Di Bello, & Boer, 2007), until now, no standard has been widely implemented, as the example of the European Union demonstrates (Filtz, Kirrane, & Polleres, 2021). However, the European Union has recently created the European Legislation Identifier (ELI), a system to make legislation available online in a standardised format so that it can be accessed, exchanged, and reused across borders (Publications Office of the European Union, 2019).

Thirdly, the user interface of the LIP must provide easy access to legal content. According to ISO 9241-11:2018 (International Organization for Standardization, 2018), usability enables users to achieve goals with effectiveness, efficiency, and satisfaction in a specific context. The first element, effectiveness, measures the accuracy and completeness of the achieved goals by users. In contrast, efficiency refers to the resources necessary to accomplish the result, which can include time, effort, costs, and materials. The last aspect, satisfaction, pertains to the user's response regarding their needs and expectations. A similar definition of usability by Nielsen (2012) also includes efficiency and satisfaction, but adds three other characteristics: learnability, memorability, and an error component. Learnability and memorability describe how easy it is to learn how to use a website and regain proficiency after a period of absence. The error component describes how easily a user can recover a desirable state after an error (e.g., after an unsuccessful search attempt). In general, good usability is essential to the success of websites, because poor usability may cause users to stop using a website or search for alternatives (Mertens et al., 2017, p. 145 ff.; Nielsen, 2012). Multiple articles have evaluated usability for websites in the public domain, especially e-government websites (e.g., de Róiste, 2013; Huang & Benyoucef, 2014; Youngblood & Mackiewicz, 2012), but they did not include websites with legal content, therefore failing to account for the particular complexity of the content. Given the shortage of suitable frameworks for LIPs, we have developed such a multicentric framework below.

3. Developing a quality framework for legal information portals

3.1. Development methodology

We have applied a systematic process consisting of four main iterative steps to develop the framework (Fig. 2). The multidisciplinary author team split into development and review teams, each consisting of one expert from each discipline, i.e., the field of law and the field of information systems. Firstly, the development team searched the existing literature for established measurements of data quality, data portability, and usability. For this purpose, we used databases such as Google Scholar, Swisscovery and Beck-online to search for terms suitable to the categories and their relation to the publication of legal data and websites. The search results were reviewed by the control team, which led to the exclusion of certain alternatives while other directions were intensified. Secondly, the development team compiled appropriate scales for the quality categories. For the categories of data portability and usability, we were able to draw primarily from existing scales and adapt and extend them for application to LIPs. For data quality, we drew from a corpus of general data-quality categories and developed suitable measurement criteria for LIPs. Thirdly, the control team reviewed the

scales and conducted additional interviews with practice experts from the involved governmental agencies of Austria, Germany, and Switzerland to verify the scales. The practice experts held high-level governmental positions (Germany and Switzerland) and/or direct operational responsibility for their respective LIP (Austria). Fourthly, the complete author team refined the criteria and scales in seven workshops conducted over the course of a year. This process helped to ensure that all criteria were a) relevant for LIPs, b) comprehensible to use and c) unambiguous in their assessment. Since the expertise was equally balanced between the different disciplines (law and information systems), we do not expect an imbalance in the scale and criteria towards either discipline. The resulting set of criteria is designed for usage in a heuristic expert review, which is a method to quickly assess website usability by consulting website developers and providers (Fernandez, Insfran, & Abrahão, 2011). While the scale allows for an individual weighting of individual criteria, we refrained from doing so to avoid potential imbalances and also because we consider the overall design to be an important aspect in the success of LIPs.

3.2. Operationalisation of the framework

3.2.1. Data quality

For the data quality measurement, we adapted the subdimensions of accuracy, completeness, timeliness, and currency, as suggested by Wand and Wang (1996). Furthermore, we added the subdimensions of accessibility, consistency, representational consistency (R. Y. Wang & Strong, 1996), and redundancy (Stvilia, Gasser, Twidale, & Smith, 2007). As of now, the criteria developed by Wand and Wang (1996) and Wang and Strong (1996) are still the most comprehensive to assess data quality (e. g., Haug, 2021; J. Wang et al., 2023). We developed custom items tailored to LIPs for all dimensions to satisfy the usage needs of our specific context (R. Y. Wang & Strong, 1996). To guarantee the best possible reproducibility of the criteria, the items are assessed on 3- or 2-point scales (Table 2). The following section discusses the individual subdimensions and their underlying characteristics in detail.

a) Accuracy

Legal materials must be published at a trusted location to ensure legal certainty and public control in the democratic process (Mast, 2022). If a LIP is the official electronic record, it must be sufficiently evident that it is an official source, which by definition provides accurate official data. Firstly, an official LIP must incorporate an appropriate URL (e.g., by selecting an official internet domain) and layout to enable users to assess the page's authenticity. However, a professional layout is only an indicator of officiality; an official-looking quality seal on a website can be easily imitated. Secondly, the website's content, in particular the legal texts, cannot have been altered by a third party. This can be ensured by a signature distinguishing the official version from third-party versions (Committee of Ministers of the Council of Europe, 2001).

b) Completeness From a Law Perspective

The completeness of data increases its quality and usefulness for users in a specific context (Mertens et al., 2017). The scope and level of detail must be adapted to the specific task for which the data is used in

1. Identification → 2. Operationalisation → 3. Verification → 4. Refinement

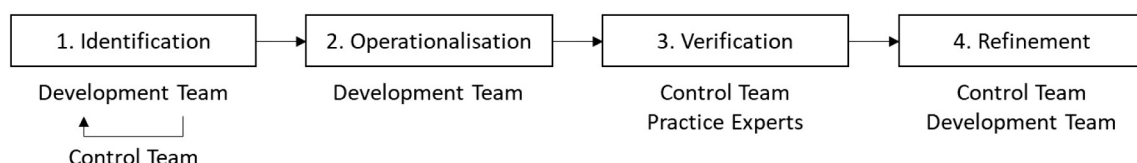| Development Team | Development Team | Control Team | Control Team |
| | | Practice Experts | Development Team |

Control Team

Fig. 2. Overview of the Framework Development Process.

order to judge its completeness. The applicability of this requirement for the publication of law now faces new issues due to the additional possibilities offered by the internet, and must therefore be reassessed.

LIPs may have various advantages over traditional paper-based systems, since they can offer a) multiple versions of legal acts with different effective dates, b) legislation from different government levels on the same platform, or c) additional legislative materials. Besides providing the comprehensive current law (with all titles, chapters, sections, etc.), LIPs should also provide the date(s) when acts have been (partially) amended so that users can quickly distinguish different versions. Ideally, they should also provide previous versions of the laws and make superordinate and subordinate acts available (in particular, the legal basis of an act, international treaties, implementing or executing acts, and similar elements). With regard to international treaties, LIPs should display the acts in their official language, the according member states, and their declarations or reservations in order to be considered complete. Due to the globalisation of legal relationships and services, LIPs should also provide the law in English, even if English is not among a country's official languages. In the future, LIPs could also be expected to not only display legal acts or case law, but also algorithms used by governments as "law-like" guidelines in any proceedings.

c) *Representational Consistency*

Representational consistency focuses on the format in which the data is presented, specifically that the format is consistent across the data (R. Y. Wang & Strong, 1996). Therefore, representational consistency assesses whether the data in LIPs is presented consistently across the latest versions of the laws as well as across legal acts with different effective dates, meaning that older and newer versions are displayed consistently. The specific format is not defined, as different countries employ various standards to create legal content and these standards are subject to social and political behaviour in the respective countries (Casanovas, Palmirani, Peroni, van Engers, & Vitali, 2016). To satisfy this criterion, LIPs should avoid data inconsistencies.

d) *Redundancy*

Redundancy implies that data does not contain two instances of the same element with the same content. If redundancy is present, changes to the underlying information can cause problems (Stvilia et al., 2007); therefore, the complete absence of duplicates is required.

e) *Timeliness and Currency*

Timeliness refers to the amount of time between when the change occurs in the real world and when data is modified in the system (Wand & Wang, 1996). If this time difference is too large, the data can be wrong, ambiguous, or meaningless, even when everything else is working perfectly (Wand & Wang, 1996). Therefore, in accordance with the Law Reform Commission of Ireland (2020, p. 14 f.) and Mast (2022, pp. 63 and 73), our framework requires that the latest regulations are marked as such and that past and future regulations are labelled accordingly.

f) *Accessibility*

Accessibility refers to the extent to which data is available or easily retrievable (R. Y. Wang & Strong, 1996). Free and easy access to the applicable regulations within a country is a fundamental right in democratic states (Weber et al., 2016, p. 31 ff.). For electronic records to be considered equal to paper-based publications, neither registration nor fees shall be required for digital access. Parallels to the traditionally "free" access to paper-based documents via public libraries are evident; however, they fall short since high search costs are associated with physical access to libraries, whereas most households have internet access (International Telecommunication Union, 2022). In addition, we assess whether the data is centrally available so users can access everything on a single website.

Table 2
Data Quality Criteria for Legal Information Portals.

Category	Criteria	Scale
Accuracy (Wand & Wang, 1996)	Official electronic record	2: The entire legislation is part of the official electronic record 1: Not all legal acts are part of the official electronic record, and/or it is not sufficiently evident that the electronic record is the official one 0: No official electronic record exists
Completeness (Wand & Wang, 1996)	Completeness within a legal act (e.g., the title of the statute, chapters, titles, section titles)	2: Yes / 0: Legal acts only partially complete (e.g., missing chapter titles)
	Dates of legislative amendments evident	2: Yes / 0: No
	Availability of superordinate and subordinate acts	2: Yes / 0: No
	International treaties: availability	2: Yes / 0: No
	International treaties: member states evident	2: Yes / 0: No
	International treaties: declarations and reservations of member states evident	2: Yes / 0: No
	Availability of previous versions	2: Yes / 0: No
	Availability of legal acts, in particular international treaties in their official languages	2: Yes / 0: No
	Availability of legislation in English, if it is not an official language	2: All acts translated/ 1: Some acts translated/ 0: No acts translated
Representational Consistency (R. Y. Wang & Strong, 1996)	Consistent format of latest legislation	2: Yes / 0: No
	Consistent format of previous and future versions of all acts	2: Yes / 0: No
Redundancy (Stvilia et al., 2007)	No duplicate information	2: Yes / 0: No
Timeliness and Currency (Wand & Wang, 1996)	Availability and labelling of the latest version	2: Yes / 0: No
	Labelling of all available versions	2: Yes / 0: No
Accessibility (R. Y. Wang & Strong, 1996)	Data centrally available	2: Yes / 0: No
	Open access (e.g., no paywall, no registration necessary)	2: Yes / 0: No

Table 3
Data Portability Criteria for Legal Information Portals.

Category	Criteria	Scale
License	Anyone is free to access the data	1: Yes / 0: No
(W3C Working Group, 2013;	Anyone is free to use the data	1: Yes / 0: No
Open Knowledge Foundation, 2022)	Anyone is free to modify the data	1: Yes / 0: No
	Anyone is free to share the data	1: Yes / 0: No
Format	Unstructured format provided (e.g., txt, PDF, Word)	1: Yes / 0: No
(W3C Working Group, 2013;	Structured format provided (e.g., CSV, Excel)	1: Yes / 0: No
Guédria et al., 2015)	Linked data provided (RDF)	1: Yes / 0: No
	Open format provided (e.g., CSV)	1: Yes / 0: No
Standards	Unique identifier provided for legal content (e.g., ELI)	1: Yes / 0: No
(Filtz et al., 2021)	Use of a standard ontology for legal norms (e.g., ELI specification)	1: Yes / 0: No
Data exchange	Files for download available	1: Yes / 0: No
(Guédria et al., 2015)	Data available via API	1: Yes / 0: No

3.2.2. Data portability

For data portability, we drew from the five-star open data model (W3C Working Group, 2013) and the NC3TA reference model for interoperability (NMI) maturity levels for data sharing as presented in Guédria, Naudet, and Chen (2015). Therefore, criteria such as the format (structured or unstructured), the openness of the format and the data (open or proprietary), and the methods of obtaining the data (Application Programming Interface [API] or file download) are emphasised. Finally, specific standards can facilitate consistent and permanent access to content. Table 3 presents an overview of the different categories and criteria.

a) Openness and Data Format

Legal content must be openly accessible ("open data") to be used by third parties without legal limitations. According to the Open Knowledge Foundation, the data must be freely a) accessible, b) usable, c) modifiable, and d) shareable by anyone (Open Knowledge Foundation, 2022). In order to comply with the five-star open data model (W3C Working Group, 2013), not just the data itself but also the data format should be open, meaning that no proprietary software is required to open the data file. Besides format openness, the range of available formats is examined to determine the maturity of the LIP in this regard (Guédria et al., 2015; W3C Working Group, 2013), including unstructured (e.g., DOCX or PDF) and structured (e.g., XLSX, CSV) formats. Additionally, to enhance machine readability, relationships in the form of links are added between data nodes in "linked data". These relationships are formalised by the RDF standard and enable detailed queries executed by default using the SPARQL language. Web pages provide endpoints so users can enter these queries to search the data (Hitzler, 2021). The supply of linked data is the most flexible but not the most convenient format for every application due to its complexity compared to other formats.

b) Standards

A standardised identifier provides unique access to specific versions of legal acts on a national (e.g., SR-number in Switzerland) or international (e.g., ELI) level. Specifically, ELI is a standard format for describing legal acts on the internet to enable easier exchange and reuse across countries (Publications Office of the European Union, 2019) to achieve greater interoperability of national LIPs (Publications Office of the European Union, 2018, p. 17). The interoperability is achieved through standardised specifications for uniform resource identifiers (URIs), which can also be used as permalinks to specific versions of the legislation, as well as specifications for metadata (e.g., title, date of entry into force, legislative body) and machine readability (Publications Office of the European Union, 2018, p. 13). According to Filtz et al. (2021), even a minimal set of standardised metadata can enhance the data

exchange. In the future, the complete and international implementation of the ELI standard would allow the possibility of querying the legislation of all EU member states with just one search (Francart, Dann, Pappalardo, Malagon, & Pellegrino, 2019, p. 144). Due to the aforementioned advantages, we expect LIPs to implement a unique identifier and a standard ontology for all legal acts similar to the ELI specification.

c) Data Exchange

One of the critical benefits of LIPs is the reusability of data by third-party applications. Obtaining the data is crucial for the application architecture to facilitate access to these applications. For simple applications or one-time use, a plain file download may be sufficient. More complex applications may require a standard exchange model to automate data access (Guédria et al., 2015). Such automated data exchange can be implemented by providing data APIs over the internet (e.g., with a RESTful-API). LIPs should serve the basic and advanced needs of third-party applications and should therefore support data retrieval through direct file download and automated access via APIs.

3.2.3. Usability

To assess the usability of LIPs, we rely on the set of usability categories established by Sagar and Saha (2017), which include items related to content organisation, navigation, search, links, layout, and user experience. These categories and items are based on ISO 9241-151 and additional heuristic guidelines. We created 3-point scales based on this, with no, partial, or complete fulfilment being the available assessment options (Table A.1).

a) Content Organisation

The website should provide the user with prominently placed notifications of updates as well as critical information about relevant updates, such as a clear title, a short summary of the changes, and a link to the altered content. Additionally, users should be able to identify the last date of an amendment; ideally, users should have access to a complete history of changes. Besides content update notifications, LIPs should provide content in different languages to facilitate access to legal content for foreign users or those with different native languages. Here, the availability of navigation features as well as meta-information in English about the nature of the legal content is essential. Additionally, a systematic overview of the legal acts that can be found on the website may help domestic and foreign users quickly gather an overview of all laws and the legal hierarchy of the acts (e.g., the systematic compilation in Switzerland). Such an overview also facilitates the ability to identify interrelated acts of legislation and helps users find a specific legal provision without a comprehensive search. The decision of whether and where a legal act is displayed within the systematic overview is an organisational action of the LIP administration, e.g., by assigning a

number to each legal act that provides information about its context and its position within the systematic overview.

b) *Navigation*

Every website organises content based on a logical structure, which is reflected in a navigation structure to enable users to easily move through the website. The navigation indirectly communicates to users where they should start their search for specific content and the path they should take to access it (Krug, 2014, p. 54 ff.). Additionally, the navigation indicates the current position of users on the page, the hierarchy and structure of the website, and how to use the website. Thoughtful navigation structures can convey a good impression and thus increase trust in the website (Krug, 2014, p. 63.).

Therefore, a well-designed navigation is organised in a meaningful manner, such that the primary navigation provides access to the main topics of a web page and optional secondary navigation elements enable access to specific aspects within the main topics. A consistently designed navigation enables orientation and recognition in the user (Jacobsen & Meyer, 2017, p. 250; Nielsen & Loranger, 2006, p. 176). According to Krug (2014, p. 62), the option to return to the home page provides a fixed point in the navigation. Therefore, our framework considers the requirement to provide a link back to the home page in the navigation and not in the layout category, as Sagar and Saha (2017) did. As a part of the navigation, a site map provides an overview of all pages, which can help users explore the content and orient themselves (Ceci & Lanotte, 2021). To facilitate fast access to the content, the subpages of a website should be short and compact to help users quickly recognise the main topics within the content (Jacobsen & Meyer, 2017, p. 444; Nielsen & Loranger, 2006, p. 187).

c) *Search*

An appropriate search facility is one of a website's most essential features because it enables users to quickly find the desired content on larger pages (Jacobsen & Meyer, 2017, p. 461; Nielsen & Loranger, 2006, p. 136). After the user enters keywords, the search engine should present a list of results with links to the relevant pages. The list should contain further information to better describe the results, e.g., the effective date, available languages, a summary of the content, or an extract with highlighted keywords. According to Jacobsen and Meyer (2017, p. 468 ff.) and Nielsen and Loranger (2006, p. 149 ff.), users should be able to sort and filter the results list by the properties of legal content, such as status, text type, or legal subject. If the search engine finds no or only a few irrelevant content matches, the result page should provide hints to improve the search, ideally with customised suggestions, such as corrected spelling or advanced search functionalities (Jacobsen & Meyer, 2017, p. 472 f.; Nielsen & Loranger, 2006, p. 157).

d) *Links and Related Content*

A link is a selected piece of content, generally a word or phrase, that allows users to move from one piece of content to another on the same or another web page. In addition to the text related to the link, users should be able to see the target of a link. Thus, the name of the link should be similar to the name of the target web page or website (Krug, 2014, p. 74 ff.), and link labels should be short and descriptive. Similarly, links should indicate whether the link's target is a file, an external web page, or a sub-page of the current website. Links can interactively reference content related to a legal provision, such as legislative materials and prior versions of the provision. Legislative materials are now available on the internet, even for rather old laws. However, the main difficulty

for legal practitioners is knowing which legal materials belong to which laws, particularly if the latter ones have been amended. Additionally, related content can improve the understanding of a legal provision. LIPs can link the appropriate content to the provision, hence facilitating easy access to the necessary information. This is an important consideration, because LIPs should provide links to future versions of a law or planned amendments as soon as such information is available.

e) *Layout*

This category incorporates multiple aspects, including category headings, titles and labels, scrolling and paging, page layout, and home page, as listed by Sagar and Saha (2017). The layout should comply with the following requirements: the title information should be placed consistently to enable users to recognise the current page and its content, and the page should avoid horizontal scrolling to prevent users from missing information only discoverable by scrolling (Jacobsen & Meyer, 2017, p. 431; Nielsen & Loranger, 2006, p. 43). Additionally, criteria from Sagar and Saha (2017) were adopted, including the requirements that the purpose of the website is recognisable, the quantity of text is appropriate, the relevant information is easily accessible from the home page, the home page layout is functional, and the readability of the text is appropriate. While some of these criteria are difficult to define precisely, the layout is an essential element of a website because a favourable first impression keeps users on a page and influences their long-term perceptions (Sheng, Lockwood, & Dahal, 2013). For LIPs, page layouts must fulfil the above requirements while also considering the large amount of complex content that must be displayed.

f) *Mobile*

Because users increasingly access LIPs with mobile devices, modern LIPs should provide a good user experience on smartphones and tablets (Berger, Matt, Steininger, & Hess, 2015). We adopt the heuristics proposed by Sagar and Saha (2017), which compare whether the functionality and content of LIPs on desktop and mobile devices are equivalent. These heuristics also assess if the text is readable on smaller devices and provides satisfactory usability, including suitable touch input.

g) *Security*

To establish user trust, LIPs should use secure protocols for communication with users. Furthermore, they should avoid using technologies that produce warning messages related to malicious software (Sagar & Saha, 2017).

h) *Customisability*

A modern website also allows for customisability (Hossain, Akter, & Rahman, 2021), including the availability of user accounts, e.g., for "favourite laws" or user-tailored notifications of changes. For example, the EU's LIP, *EUR-Lex*, already offers similar functionality at the European level through individual user accounts.

i) *User Experience*

This dimension captures vital aspects based on Sagar and Saha (2017), which are not included in the abovementioned dimensions. First and foremost, LIPs should enable users to establish a channel for communication and feedback with LIP providers via a web form or contact email. Additionally, appropriate help tools should provide users

with information about the use of the website (e.g., an explanation of the navigation or search feature) or details about the legal system (e.g., the interaction of different levels of the government or the systematic collection of regulations based on the legal characteristics of the country). Further criteria involve declarative naming of URLs, helpful information in error messages, and the avoidance of unnecessary windows opening during website use.

3.3. Application of the framework

For this article, the LIPs of the DACH countries (Germany, Austria, and Switzerland), which are operated on behalf of the respective governments, were chosen as illustrative examples. We chose these LIPs due to the similarities of their respective legal systems and the authors' knowledge thereof. In Germany, the website *Gesetze im Internet* currently fulfils the role of a LIP. In Switzerland, we examine *Fedlex*, which acts as a portal for all federal laws, including the official record, the systematic compilation, international treaties, and government legislative materials. Austria's LIP, *Rechtsinformationssystem des Bundes*, serves to disclose federal and state law even more extensively by aiming to document the entirety of Austrian law, including regulations on the municipal level and jurisprudence. Austria and Switzerland have designated their respective systems as the official information medium (in Switzerland as of 2016 for federal laws, in Austria as of 2004 for the federal level and currently also for local law). In both countries, the digital publication replaced the paper-based publication.

The following results section serves two purposes. Firstly, it illustrates the framework's applicability with three similar LIPs. Secondly, it indicates the current achievements of these LIPs regarding the underlying criteria.

3.4. Results

3.4.1. Data quality

A summary of the results is presented in Table 4; these will be discussed below.

a) *Accuracy*

The LIPs of Austria and Switzerland contain the official electronic record of the law in the respective countries (in Switzerland only for federal law). Therefore, the content of the LIPs is accurate. Meanwhile, in Germany, only the paper-based form is legally binding and, therefore, the accurate version. Additionally, the use of a concise subdomain (Austria: "ris"; Switzerland: "fedlex"; in Germany in the future: "recht" [German Bundesrat, 2022], which precedes an already known domain name (Austria: "bka"; Switzerland: "admin"; in Germany in the future: "bund"), helps in establishing the authenticity of the LIPs. The URL becomes evident by looking at the current German domain "gesetze-im-internet", which could raise justified doubts for users about whether it is an official LIP. Austria and Switzerland sign their official versions electronically to ensure authenticity and to prevent changes by unauthorised third parties. These signatures can be verified via dedicated websites or PDF software. Even for professional users, verifying authenticity is cumbersome, but it is necessary due to the lack of alternatives. Mitee (2017) has suggested introducing a generic top-level domain (gTLD) to be used exclusively for LIPs (e.g., ".officiallaws") which would make it easier for professionals to determine the accuracy of foreign legal systems, but this suggestion is arguably beyond the reach of a single LIP provider.

b) *Completeness From the Point of View of the Law*

The law available on the LIPs of Austria, Germany, and Switzerland is complete on the federal level, and the Austrian LIP covers most of the sub-federal level as well. They each contain the respective regulation's titles, chapter titles, section titles, etc. In the German LIP, dates of amendments of consolidated laws are unavailable, unlike the LIPs of Austria and Switzerland, although both follow slightly different approaches. The Swiss LIP indicates the amendment date via footnotes placed in the appropriate locations within the regulation; the Austrian LIP requires the user to access a single section to view amendment dates. When making superordinate and subordinate acts available, all three LIPs fulfil the criterion, but they differ regarding international treaties.

Table 4
Results regarding Data Quality.

Category	Scale	Austria	Germany	Switzerland
Accuracy				
Official electronic record	[0–2]	2	0	2
Completeness from the point of view of the law				
Completeness within a legal act	[0/2]	2	2	2
Dates of amendments evident	[0/2]	2	0	2
Availability of superordinate and subordinate laws	[0/2]	2	2	2
International treaties: availability	[0/2]	2	0	2
International treaties: member states evident	[0/2]	2	0	2
International treaties: declarations/reservations of member states evident	[0/2]	2	0	0
Availability of previous versions	[0/2]	2	0	2
Availability of legislation in all official languages	[0/2]	2	2	2
Availability of the legal content in English	[0–2]	1	1	1
Representational Consistency				
Consistent format of latest legislation	[0/2]	2	2	2
Consistent format of all legal acts across time	[0/2]	2	2	0
Redundancy				
No duplicate information	[0/2]	2	2	2
Timeliness and Currency				
Availability and labelling of the latest version	[0/2]	2	0	2
Labelling of all available versions	[0/2]	2	2	2
Accessibility				
Data available centrally	[0/2]	2	0	2
Open access	[0/2]	2	2	2
Total		33 (97%)	17 (50%)	29 (85%)

Austria and Switzerland make these accessible to users and note the corresponding member states. Austria additionally provides possible reservations, therefore earning full marks regarding the three criteria on international treaties. The German LIP falls short here by not providing international treaties. Germany's LIP also does not provide previous versions of the law, whereas the LIPs of Austria and Switzerland do. All three LIPs fulfil the criterion of making regulations available in all official languages, however, Austria and Germany have only one official language (German), while Switzerland has three (German, French, and Italian). Lastly, none of the LIPs received the full score for making laws available in English because they all provided English translations for only a select few.

c) *Representational Consistency*

The LIPs of Austria, Germany, and Switzerland all consistently display the latest legal acts; Austria also displays all legal acts with different effective dates. In the Swiss LIP, the evaluation of consistent formatting between regulations over time is slightly more complex because HTML, Word, and XML formats are generally only available for acts with an effective date of 2021 or later, with earlier versions after 2000 available in PDF form. Because of the at least 20-year backlog of PDFs, we consider the criterion for consistent formatting over time as fulfilled by Switzerland's LIP. In Germany, all available versions of the laws are presented in a consistent format.

d) *Redundancy*

None of the reviewed LIPs display duplicate information; therefore, all fulfil this criterion.

e) *Timeliness and Currency*

The clarity of the display of the effective date when a law has entered or will enter into force is not only a question of usability, but also affects data quality since ambiguities can cause errors in the application of the law. The current German LIP does not yet include old and new versions, but this feature is planned for a new version. Additionally, we have observed that there is sometimes a delay between the publication of changes by the German lawmakers in the *Bundesgesetzblatt* (Federal Law Gazette) and the implementation into the German LIP, where the law is displayed in a compiled format (www.gesetze-im-internet.de). Austria's and Switzerland's LIPs offer previous, current, and future versions, each

taking a different approach but always indicating the version. For the Austrian LIP, each consolidated law offers the option to display the version in force on a specific date in the past, selectable by the user. However, the presentation and handling of this feature are non-intuitive and inconvenient. For the Swiss system, the systematic compilation's sidebar displays a list of the full versions generated after each amendment, with colour coding to make it easy to see which versions are out of date, which are in force, and which are future versions.

f) *Accessibility*

On all examined LIPs, the content is freely available without barriers such as paywalls or mandatory registrations that would hinder or complicate user access. With regard to the central availability of the data, in the Swiss and the Austrian systems, all relevant information appears in one place and is always up to date. In Germany, the information is currently communicated via two websites (gesetze-im-internet.de and bgbl.de).

3.4.2. *Data portability*

The LIPs of Austria, Germany, and Switzerland offer free access and reuse of legal texts. However, only the Austrian LIP offers true open data under a Creative Commons license (Austrian Ministry of Finance, 2022). In Switzerland, the modification of legal texts is explicitly prohibited (Federal Chancellery of Switzerland, 2023). In Germany, the right to share the data is not explicitly given (German Ministry of Justice, 2023). As for the data formats, all LIPs provide both unstructured (mostly PDF) and structured (XML) data formats. Additionally, they offer open formats as an alternative to the commonly used proprietary DOCX format. Germany and Switzerland enable downloads of legal data in XML format, and the Austrian LIP offers an XML format just over its API, but not for direct download. Only Switzerland currently implements a standard ontology within the XML format, i.e., the akomantoso standard and parts of the Functional Requirements for Bibliographic Records (FRBR) model. Even though the Austrian LIP is the only LIP to offer an API, this API provides automated access to an overview of all legal acts but not to a specific legal provision. Only the Swiss LIP currently offers content as linked data via a SPARQL endpoint. However, this endpoint is still in the early stages of development and does not offer extensive functionalities. Austria, and even Switzerland – although not an EU member – have implemented the ELI identifier. All results of the assessment are captured in Table 5.

Table 5
Results regarding Data Portability.

Category	Scale	Austria	Germany	Switzerland
Format				
Unstructured format provided	[0/1]	1	1	1
Structured format provided	[0/1]	1	1	1
Linked data provided	[0/1]	0	0	0
Open format provided	[0/1]	1	1	1
License				
Anyone is free to access the data	[0/1]	1	1	1
Anyone is free to use the data	[0/1]	1	1	1
Anyone is free to modify the data	[0/1]	1	1	0
Anyone is free to share the data	[0/1]	1	0	1
Standards				
Unique identifier provided for legal norms	[0/1]	1	0	1
Use of a standard ontology for legal norms	[0/1]	0	0	1
Data exchange				
Files available for download	[0/1]	1	1	1
Data via API available	[0/1]	0	0	0
Total		9 (75%)	7 (58%)	9 (75%)

Table 6

Results regarding Usability.

Category	Scale	Austria	Germany	Switzerland
Content Organisation				
Date of last update available	[0–2]	0	0	0
News is placed prominently and linked with content	[0–2]	2	2	2
Multilanguage support	[0–2]	2	1	2
Overview of the classification of regulations available	[0/2]	2	0	2
Navigation				
Shows users their current position	[0–2]	0	0	2
Provides a site map	[0/2]	2	0	0
Consistent between overview and content	[0–2]	0	1	2
Meaningful organisation of the navigation	[0–2]	0	0	1
Subdivision of long pages	[0–2]	1	0	2
Link back to home page	[0–2]	2	0	2
Search				
Availability of search	[0/2]	2	2	2
Suggestions for unsuccessful searches	[0–2]	1	0	0
Descriptiveness of search results	[0–2]	2	0	2
Scope of search	[0–2]	2	0	2
Advanced search options	[0–2]	2	0	1
Full-text search	[0/2]	2	2	2
Ordering of search results	[0–2]	2	0	0
Error-tolerant search	[0/2]	0	0	2
Links and related content				
Links are distinguished from each other	[0–2]	1	1	2
No dead links	[0/2]	2	2	2
Short and descriptive links	[0–2]	2	2	2
Links to related legislative materials	[0–2]	2	0	2
Links to future versions of legal acts	[0–2]	2	0	2
Links to related legal acts	[0–2]	0	0	0
Layout				
Title information placed consistently	[0–2]	1	2	2
No horizontal scrolling	[0/2]	0	0	2
Purpose of website recognisable	[0–2]	2	2	1
Quantity of text is appropriate	[0–2]	2	2	2
Relevant information is easily accessible from home page	[0–2]	1	2	2
Functional home page layout	[0–2]	2	2	2
Appropriate readability of text	[0–2]	2	2	2
Mobile				
Text readable on mobile devices	[0–2]	2	2	2
Links and buttons large enough for touch input	[0–2]	1	1	2
Viewport fits size of mobile devices	[0–2]	2	2	2
Loads perfectly on mobile devices	[0–2]	2	2	2
Mobile version provides same functionality as desktop version	[0–2]	2	2	1
Security				
Encrypted connection between user and server	[0–2]	1	2	2
No warning related to malicious software or similar	[0–2]	2	2	2
Customisability				
Options to customise the user experience available	[0/2]	0	0	0
User Experience				
No opening of unnecessary windows	[0–2]	1	2	2
Help provided	[0–2]	1	1	1
Accurate error pages	[0/2]	2	0	2
Descriptive naming of URLs	[0–2]	2	2	1
Acceptance of online user feedback	[0/2]	0	2	0
Communication with site enabled	[0–2]	1	1	2
Total		62 (69%)	46 (51%)	70 (78%)

3.4.3. Usability

In the following section, the results for usability are presented in detail; Table 6 includes an overview of the results.

a) *Content Organisation*

Remarkably, none of the LIPs provide a prominent notification of the date of the last update or the history of updates. Hence, users are unable to determine whether the most recent legislative changes are already included. In contrast to the Austrian and Swiss LIP, with the exception of some laws, the German LIP does not provide content in English, which makes it much more difficult to use for non-German speakers. Aside from the respective official languages, the LIPs of Austria and Switzerland only offer some content in English. The Swiss LIP provides the same functionality for translated pages, while the Austrian LIP offers reduced search functionality for translated pages, limiting searches to essential functions. The German LIP lacks a systematic overview of the displayed legal acts. Austria has a numerical classification system in the form of the "Index of Federal Law", however, it only contains broad categories and does not assign a systematic number to each legal act. In Switzerland, every legal act of federal law is assigned a number, the SR number, which corresponds to its place within the systematic order of the laws (e.g., laws regarding [national] criminal law all have the same first SR number). This leads to the ideal of a complete classification of the law by topics.

b) *Navigation*

In general, the examined LIPs offer links to the main topics in the primary navigation, which makes it difficult for users to navigate within these main topics. They do not offer secondary navigation with links to essential aspects within the topics, which could help users find more specific subpages. In Switzerland, this problem is mitigated by a clickable path from the home page to the current page (so-called breadcrumbs), thus enabling users to recognise their current position on the LIP.

c) *Search*

The search functionality of the Austrian system is quite advanced, offering multiple options to refine the search, such as fields for an effective date or logical queries. The Swiss system offers functions such as filters for effectiveness or norm type but lacks options for sorting the results and advanced search mechanisms such as logical queries. The search feature on the German website *Gesetze im Internet* offers hardly any functionality aside from the ability to enter keywords connected by logical queries. A further limitation is that users must decide whether to use AND or OR operators in these queries because the two types cannot be combined within one search request. All search engines in the examined LIPs fail to support users with standard or customised suggestions after a search with no or minimal matches. Hence, all three LIPs have the potential to improve the user experience through an improved search engine.

d) *Links and Related Content*

In all examined LIPs, most of the links are named in a comprehensible way. This allows users to determine whether they will reach their desired destination by clicking the link. On the Swiss LIP, it is always apparent whether links will refer to an internal or external resource like a website or a file, whereas this is not always the case for the Austrian and German LIPs. With Austria, and to a limited extent Switzerland, legislative materials are linked in the appropriate places. Additionally, these LIPs provide links to different versions of the legal acts. Interestingly (and unfortunately), none of the LIPs offer links to related legal provisions that could be relevant in the same context.

e) *Customisability*

All examined LIPs provide an RSS feed or newsletter that is quite broad in content without offering much customisability, for instance, regarding specific areas of law. Combined with the digital publication, all three LIPs should consider offering a more customisable notification service in the form of an e-mail newsletter.

f) *Layout*

All three LIPs use an appropriate layout, thus satisfying most layout requirements. On the German and Austrian LIPs, some pages require horizontal scrolling, making it more difficult for users to see all the content of the page at one time. Additionally, the Austrian LIP omits the main title on some pages, and also hides the main search function on a sub-page, further hindering access to relevant information.

g) *Mobile*

The LIPs of all three countries offer an appropriate mobile experience that is similar to the desktop version. The German and Austrian LIPs could further increase the size of buttons and navigation items on mobile devices to increase usability for devices with touch input. However, given these achievements, we recommend that all LIPs focus on improving usability in non-mobile categories.

h) *Security*

All LIPs satisfy the primary criteria concerning website security, however, the Austrian LIP server does not always use the secure HTTPS protocol during some file downloads, using the older HTTP protocol instead.

i) *User Experience*

All three LIPs provide adequate user experience with only moderate remaining potential for improvement. In general, the LIPs should provide more extensive help pages about the legal system to improve users' understanding of the legal content. In contrast, all LIPs provide help pages on how to use their own systems, which differ in the level of detail. All LIPs enable users to communicate with the site provider, but the German LIP explicitly allows users to provide feedback about the website. Concerning error pages, the German LIP falls short compared to the other LIPs, lacking a descriptive error page.

4. Discussion and implications

While previous research has identified that several states still lag behind in offering LIPs that fulfil even the basic functionalities of availability, searchability, and reusability of online legal content (Nishikawa-Pacher & Hamann, 2023), we go one step further with the development of our multicentric quality framework for LIPs. The framework conveys a structured understanding of the main characteristics and configuration options of LIPs, which determine their later value for users as well as for other applications that can profit from LIPs' data portability. The number of criteria required among these three dimensions illustrates the complexity of offering legal information publicly, which could explain the challenges many states face in providing state-of-the-art LIPs (not to mention the propensity of states to fulfil their legal obligations to make law data accessible but not necessarily take the trouble to do so in a user-friendly way). With our framework, LIP providers can assess the qualities of their current implementations, identify areas for improvement, and track their success over time. In our approach, we deliberately do not go as far as Chang (2021), who suggests building a network-based LIP from scratch and provides a fairly simple initial prototype. Chang (2021) also identifies this endeavour as "ambitious", since such a "greenfield" approach requires decisions that are often beyond the scope of a single governmental entity, and therefore can take a long time or even fail. We therefore chose a more conservative approach that supports the development of current LIPs towards a more user-centric perspective that capitalises on today's technological capabilities. Given the shortcomings of most LIPs, we see this as a critical first step that must be taken before other, more far-reaching measures (e.g., new forms of collaboration between different legal entities or the integration of LIPs into legal ecosystems) are addressed.

From a theoretical point of view, we recommend more research on how the three dimensions of data quality, data portability, and usability can work together efficiently and effectively in an environment where complex content is provided and searched for. Our work corresponds to the research stream on improving search algorithms for legal content in computer science (Arora et al., 2018; Zhang, Ai, Wu, Ma, & Liu, 2023). Based on our framework, LIPs with poor content search and retrieval functions could use these algorithms to improve their current offerings. Our framework can enrich the research on improving legal search algorithms, as we provide a set of relevant and measurable criteria for data quality and data portability that can be used as the basis for algorithm improvement. We focused our efforts on using new technologies to transform today's LIPs, many of which are still not very user-friendly, into modern and user-friendly access portals for legal information. However, along with technological and scientific progress, we recommend that future research introduce additional criteria or dimensions.

Table 7
Future Extensions of the Framework.

Dimension	Category	Potential criteria
User experience	AI-based user experience (Chen et al., 2021)	AI-based personalised content and service recommendations
		User support through virtual agents (e.g., chatbots or voice assistants)
Content organisation	Legal language model (Filtz et al., 2021)	Train language model based on LIPs legal data
	Legal knowledge graph (Filtz et al., 2021)	Automatic extraction of legal rules and constraints into legal knowledge graph
	Blockchain technology (Kassen, 2022)	Content management through blockchain technology
Network integration	Integrated network with other e-government services (Malodia et al., 2021)	Enhanced collaboration with other e-government services
		Seamless integration of different e-government services (single-window application)

Based on recent literature and early-stage projects, we suggest that there is room for further improvement in the dimensions of "user experience" and "content organisation" as well as a new dimension, "network integration" (Table 7). The user experience element could benefit from the integration of artificial intelligence (AI) technologies, which could offer more advanced forms of personalised content or service recommendations as well as act as virtual assistants to reduce the cognitive burdens of users (Chen, Guo, Gao, & Liang, 2021). Content organisation could be enhanced by training a language model with the data of the LIP, which in turn could provide value by offering more efficient search results and chatbot services to users. Furthermore, the automatic integration of the data in a legal knowledge graph as linked data could improve the searchability and querying potential of the LIP (Filtz et al., 2021). Additionally, blockchain technologies could offer a more reliable public content management system with support for institutional verification of legal content (Kassen, 2022). Our proposed new network integration dimension could consider interoperability with other e-government services (Malodia, Dhir, Mishra, & Bhatti, 2021). This includes a tighter integration between legal content or other LIP services and existing e-government services, and could eventually lead to a seamless integration of the major e-government services into a single application. Many of these developments are too premature to enable the specification of precise measurements (e.g., the use of AI or blockchain technologies), and others require concentrated efforts that may be beyond the capabilities of an individual LIP provider (e.g., LIP integration into larger ecosystems and pan-European services such as www.manylaws.eu). Especially with regard to the content and data offering dimension, existing LIPs need to incorporate modern technologies in order to achieve their full potential (e.g., language models or legal knowledge graphs).

To complement our understanding of the development and configuration of LIPs in practice, the criteria of our framework can serve as a basis for a better understanding of the organisational and legal mechanisms that lead to specific LIP design decisions. For instance, particular data governance practices, which could be the result of path dependencies or the availability of certain skills or infrastructure, may either foster or restrict particular LIP design decisions related to data portability or data quality (Janssen, Brous, Estevez, Barbosa, & Janowski, 2020). The relationship between organisational and legal mechanisms and LIP design decisions is therefore also of particular interest, since they may also affect the responsibility of different units within government organisations (e.g., legal department, internal or external IT providers, organisational development).

Beyond the concrete case of LIPs, our framework provides practitioners with an initial foundation for the development and evaluation of other data-sensitive content services in the public domain, e.g., other service, interaction, and information portals. The implementation of data portability criteria along with classical content- and usability-related factors provides additional value in the development of state-of-the-art LIPs that could become a cornerstone in public data ecosystems (Linåker & Runeson, 2021; Yoon & Copeland, 2020). By establishing these data portability criteria, practitioners can create synergies between their LIPs and other internal and external applications to create additional market value. Considering the importance of LIPs to the legal industry and the resulting increase in their usage, one can imagine that LIPs will not only be a hub for legal information but also other legal services, such as online dispute resolution, a download centre for legal forms, chatbot-based advice, and real-time monitoring or compliance with regulations. Therefore, they may help users navigate legal matters and allow them to evaluate and verify legal advice, whether from a legal professional or a consumer website, more easily. They may even be able to formulate legal solutions themselves or at least provide their counsel with ideas ("democratisation"). However, such developments must be closely monitored, as abbreviated information can easily lead to misinformation in the legal sector.

It is important that LIP providers meet the data portability criteria as outlined in our framework in order to foster the development of adjacent products and/or businesses. As a result, content creators in the legal field, such as law firms, consumer organisations, and publishers will be able to keep legal information on their websites or included in automatically generated documents and templates up to date with more accuracy and less effort. Being able to easily source accurate (Section 3.2.1.a) legal data can also make life easier for businesses or legal software developers since monitoring changes in law (compliance) becomes less arduous. It is therefore crucial that the legal data on LIPs be provided in a structured format, ideally through an API (Section 3.2.2). In the future, the published laws might not just consist of pure text but may also be enriched with business rules and legal models. In the future, we might see additional collaborations between government LIPs and private businesses or publishers, for example, in aggregating legal data and sources or providing legal solutions or advice.

Although the commercialisation of LIPs was not in our focus, this raises questions as to which LIP functionalities – including data quality, data portability, and usability – should be offered by governments free of charge. For example, using a freemium model (Mäntymäki, Islam, & Benbasat, 2020), LIPs could charge a fee for some of the functions beyond the actual publication of laws (e.g., additional search options, automatic comparison of different versions) to cover the costs of the basic service. However, the legal question of whether states should be allowed to offer paid LIP functions or whether such activities would interfere with the interests of the private sector is beyond the scope of this manuscript.

5. Conclusion and limitations

Recent struggles demonstrate the challenges experienced by states in realizing the full potential of LIPs to provide legal information to the public. These struggles may be driven by a focus on formal legal criteria at the expense of user-based criteria. To provide guidance, we have developed a multicentric quality measurement framework for LIPs that considers the dimensions of data quality, data portability, and usability. The framework presents LIP providers with an easy-to-use tool to assess the quality of their current LIPs and gives them guidance on how to identify potential for improvement and measure their progress over time. The exemplary application of the framework to the LIPs of Germany, Austria, and Switzerland illustrates that LIPs display clear qualitative differences and continue to evolve. Our framework can serve as a starting point for developing other frameworks and for future research on data-based services that require high standards of data quality and usability.

Our research is not free of limitations. Firstly, we developed and

applied our framework in the context of three countries that share similar legal frameworks (e.g., civil-law system, federal system) and culture. We must acknowledge that in addition to the variation in LIP implementation, the legal, social, and economic requirements and cultures of these three countries may vary substantially from other countries. Such differences may require other types of LIP implementation or a weighing of the different quality dimensions. However, given the structure of our framework, we see it as an initial comprehensive foundation that can be adapted to other states and their legal frameworks. Secondly, it should be noted that the requirements for LIPs are not static and might change over time. This applies to legal requirements pertaining to data quality, but also to the technology-related categories of data portability (e.g., relevant data export) and usability (e.g., how user interactions are designed). Because of the dynamic nature of these technologies, adaptations to the framework might be necessary in the future. For this reason, we have not only applied the utmost care in selecting state-of-art scales, but we also considered their susceptibility to technological change and opted for those with higher stability. We also must acknowledge that increasing data portability, which may enable new services (e.g., e-justice services), could also impose further

requirements for LIPs. Finally, we might also see shifts in the user base of LIPs (e.g., from professionals to consumers) that could require further adjustment of the framework. However, the potential for future necessary adjustments in no way limits the current utility of a measurement framework, and owing to its transparency, the framework could easily be adapted if necessary.

Author statement

Christian Matt: Conceptualization, Methodology, Writing – original draft; Florian Eichel: Conceptualization, Methodology, Writing – review & editing; Manuel Bieri: Writing – original draft, Investigation, Methodology, Visualization; Daniel Pfäffli: Writing – original draft, Investigation, Methodology.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Appendix

Table A.1
Usability Criteria for Legal Information Portals (based on Sagar & Saha, 2017).

Category	Criteria	Scale
Content Organisation	Date of last update available	2: History of updates
		1: Last update
		0: Not available
	News is placed prominently and linked with content	2: Available and prominent
		1: Available
		0: No
	Multilanguage support	2: Official languages and English available
		1: Official languages available
		0: Not all official languages available
	[a] Overview of the classification of regulations available	2: Yes / 0: No
Navigation	Shows users their current position	2: Available and prominent
		1: Available
		0: Not available
	Provides a site map	2: Yes / 0: No
	Consistent between overview and content	2: Consistent on all pages
		1: Consistent on some pages
		0: Not consistent on all pages
	Meaningful organisation of the navigation	2: Meaningful and detailed
		1: Meaningful but lacking detail
		0: No
	Subdividing long pages	2: Always divided
		1: Some subpages too long
		0: All subpages too long
	[b] Linking back to home page	2: Always / 1: Sometimes / 0: No
Search	Availability of search	2: Yes / 0: No
	Suggestions for unsuccessful searches	2: Custom suggestions
		1: General suggestions
		0: No suggestions
	Descriptiveness of search results	2: At least 3 details
		1: 1–2 details
		0: No details
	Scope of search	2: Scope freely adjustable
		1: Scope limitedly adjustable
		0: No adjustments possible
	Advanced search options	2: Queries and filters
		1: Queries or filters
		0: Nothing
	Full-text search	2: Yes / 0: No
	Ordering of search results	2: At least 3 ordering options
		1: 1–2 ordering options
		0: No ordering options
	Error-tolerant search	2: Minor spelling mistakes result in appropriate matches and suggestions
		0: Minor spelling mistakes do not result in appropriate matches and suggestions

Table A.1 (*continued*)

Category	Criteria	Scale
Links and related content	Links are distinguished from each other	2: Links are visually distinguished
		1: Links are mostly visually distinguished
		0: No visual difference within links
	No dead links	2: Yes / 0: No
	Short and descriptive links	2: Always short and descriptive
		1: Often short and descriptive
		0: Not short and descriptive
	[a] Links to related legislative materials	2: Available and linked
		1: Available
		0: Not available
	[a] Links to future versions of a legal norm	2: Available and linked
		1: Available
		0: Not available
	[a] Links to related legal norms	2: Available and linked
		1: Available
		0: Not available
Layout	[b] Title information placed consistently	2: Always consistent
		1: Partially consistent
		0: Not consistent
	[b] No horizontal scrolling	2: Yes / 0: No
	[b] Purpose of website recognisable	2: Evident and prominent
		1: Evident
		0: Not evident
	[b] Quantity of text is appropriate	2: Fully appropriate
		1: Partially appropriate
		0: Not appropriate
	[b] Relevant information easily accessible from home page	2: Easily accessible
		1: Accessible
		0: Not accessible
	[b] Functional home page layout	2: Yes / 1: Limited / 0: No
	[b] Appropriate readability of text	2: Always appropriate
		1: Sometimes appropriate
		0: Not appropriate
Mobile	Text readable on mobile devices	
	Links and buttons large enough for touch input	2: Satisfying on smartphone and tablet
	Viewport fits size of mobile devices	1: Satisfying on smartphone or tablet
	Loads perfectly on mobile devices	0: Not satisfying on mobile devices
	Mobile version provides same functionality as desktop version	
Security	Encrypted connection between user and server	2: Always / 1: Sometimes / 0: No
	No warnings related to malicious software or similar	2: Always / 1: Sometimes / 0: No
Customisability	[a] Options to customise the user experience available	2: Yes / 0: No
User Experience	No unnecessary windows opening	2: No pop-ups opened
		1: Pop-ups opened for downloads
		0: Pop-ups for different uses opened
	Providing help	2: Available for website and legal system
		1: Available for website or legal system
		0: No help available
	Accurate error pages	2: Yes / 0: No
	Descriptive naming of URLs	2: Always self-explanatory URLs
		1: Sometimes self-explanatory URLs
		0: Incomprehensible URLs
	[b] Accepting online user feedback	2: Yes / 0: No
	[b] Enabling communication with site owner	2: E-mail and online form
		1: E-mail or online form
		0: No communication channel available

[a] We added the criterion to the existing set of criteria by Sagar and Saha (2017).

[b] Criterion was moved to a new category compared with Sagar and Saha (2017).

References

Arora, P., Hossari, M., Maldonado, A., Conran, C., Jones, G. J. F., Paulus, A., … Dirschl, C. (2018). In *Challenges in the development of effective systems for professional legal search. The first international workshop on professional search; the second workshop on knowledge graphs and semantics for text retrieval, analysis, and understanding; and the international workshop on data search* (pp. 29–34).

Austrian Ministry of Finance. (2022, September 12). RIS daten version 2.6. https://www.data.gv.at/katalog/dataset/ris2_6.

Baheer, B. A., Lamas, D., & Sousa, S. (2020). A systematic literature review on existing digital government architectures: State-of-the-art, challenges, and prospects. *Administrative Sciences, 10*(2), 25. https://doi.org/10.3390/admsci10020025

Baker, T., Bermès, E., Coyle, K., Dunsire, G., Isaac, A., Murray, P., Panzer, M., Schneider, J., Singer, R., Summers, E., Waites, W., Young, J., & Zeng, M. (2011). W3C incubator group report 25 October 2011. https://www.w3.org/2005/Incubator/lld/XGR-lld-20111025/.

Barcevičius, E., Cibaitė, G., Codagnone, C., Gineikytė, V., Klimavičiūtė, L., Liva, G., Matulevič, L., Misuraca, G., & Vanini, I. (2019). *Exploring digital government transformation in the EU - Analysis of the state of the art and review of literature (No. JRC118857; EUR 29987 EN)*. Publications Office of the European Union.

Batini, C., Cappiello, C., Francalanci, C., & Maurino, A. (2009). Methodologies for data quality assessment and improvement. *ACM Computing Surveys, 41*(3), 1–52.

Berger, B., Matt, C., Steininger, D. M., & Hess, T. (2015). It is not just about competition with "free": Differences between content formats in consumer preferences and willingness to pay. *Journal of Management Information Systems, 32*(3), 105–128. https://doi.org/10.1080/07421222.2015.1095038

Boer, A., Hoekstra, R., Winkels, R., & van Engers, T. (2002). Metalex: Legislation in xml. *Legal Knowledge and Information Systems*, 1–10.

Casanovas, P., Palmirani, M., Peroni, S., van Engers, T., & Vitali, F. (2016). Semantic web for the legal domain. *Semantic Web, 7*(3), 213–227. https://doi.org/10.3233/SW-160224

Ceci, M., & Lanotte, P. F. (2021). Closed sequential pattern mining for sitemap generation. *World Wide Web, 24*(1), 175–203. https://doi.org/10.1007/s11280-020-00839-2

Chang, C. (2021). Improving access to free online legal information through universal design: User personas, user journeys, a proposal, and a prototype. *Legal Reference*

Services Quarterly, 40(4), 199–281. https://doi.org/10.1080/0270319X.2021.2003686

Chen, T., Guo, W., Gao, X., & Liang, Z. (2021). AI-based self-service technology in public service delivery: User experience and influencing factors. *Government Information Quarterly, 38*(4), Article 101520. https://doi.org/10.1016/j.giq.2020.101520

Clarke, A. (2020). Digital government units: What are they, and what do they mean for digital era public management renewal? *International Public Management Journal, 23*(3), 358–379. https://doi.org/10.1080/10967494.2019.1686447

Committee of Ministers of the Council of Europe. (2001, February 28). Recommendation Rec(2001)3 of the Committee of Ministers to member states on the delivery of court and other legal services to the citizen through the use of new technologies. https://search.coe.int/cm/Pages/result_details.aspx?ObjectId=09000016805e2aa7.

Eichel, F., Matt, C., Pfäffli, D., & Bieri, M. (2022). Rechtsinformationsportale und die digitale Bekanntgabe von Gesetzen. *JuristenZeitung, 77*(13), 639–648. https://doi.org/10.1628/jz-2022-0218

ELI Taskforce. (2017). Usability study in the context of the use of European Legislation Identifier. Retrieved February 24, 2023, from https://eur-lex.europa.eu/content/eli-register/ELI_usability_study_results-final.pdf.

Eom, S.-J., & Lee, J. (2022). Digital government transformation in turbulent times: Responses, challenges, and future direction. *Government Information Quarterly, 39*(2), Article 101690. https://doi.org/10.1016/j.giq.2022.101690

Federal Chancellery of Switzerland. (2023). *Technische und rechtliche Informationen für Drittverwerter.* Fedlex - The Publication Platform for Federal Law Search. Retrieved June 14, 2023, from https://www.fedlex.admin.ch/de/broadcasters. Retrieved June 14, 2023, from.

Fernandez, A., Insfran, E., & Abrahão, S. (2011). Usability evaluation methods for the web: A systematic mapping study. *Information and Software Technology, 53*(8), 789–817. https://doi.org/10.1016/j.infsof.2011.02.007

Filtz, E., Kirrane, S., & Polleres, A. (2021). The linked legal data landscape: Linking legal data across different countries. *Artificial Intelligence and Law, 29*, 485–539. https://doi.org/10.1007/s10506-021-09282-8

Francart, T., Dann, J., Pappalardo, R., Malagon, C., & Pellegrino, M. (2019). The European legislation identifier. In G. Peruginelli, & S. Faro (Eds.), *Vol. 317. Knowledge of the law in the big data age* (pp. 137–148). IOS Press.

German Bundesrat. (2022). Regierungsentwurf (RegE) für ein Gesetz zur modernisierung des Verkündungs- und Bekanntmachungswesens, Art. 3. *Bundesratsdrucksache, 243*(22), 13–38.

German Ministry of Justice. (2023). Gesetze im Internet—Hinweise. Retrieved June 14, 2023, from https://www.gesetze-im-internet.de/hinweise.html.

Guédria, W., Naudet, Y., & Chen, D. (2015). Maturity model for enterprise interoperability. *Enterprise Information Systems, 9*(1), 1–28. https://doi.org/10.1080/17517575.2013.805246

Haug, A. (2021). Understanding the differences across data quality classifications: A literature review and guidelines for future research. *Industrial Management & Data Systems, 121*(12), 2651–2671. https://doi.org/10.1108/IMDS-12-2020-0756

Heckmann, D. (1997). *Geltungskraft und Geltungsverlust von Rechtsnormen* (1st ed.). Mohr Siebeck.

Hitzler, P. (2021). A review of the semantic web field. *Communications of the ACM, 64*(2), 76–83. https://doi.org/10.1145/3397512

Hoekstra, R., Breuker, J., Di Bello, M., & Boer, A. (2007). The LKIF core ontology of basic legal concepts. *CEUR Workshop Proceedings, 321*, 43–63.

Hossain, M. A., Akter, S., & Rahman, S. (2021). Customer behavior of online group buying: An investigation using the transaction cost economics theory perspective. *Electronic Markets, 32*, 1447–1461. https://doi.org/10.1007/s12525-021-00479-y

Huang, Z., & Benyoucef, M. (2014). Usability and credibility of e-government websites. *Government Information Quarterly, 31*(4), 584–595. https://doi.org/10.1016/j.giq.2014.07.002

International Organization for Standardization. (2018). Ergonomics of human-system interaction—Part 11: Usability: Definitions and concepts (ISO Standard No. 9241–11:2018). https://www.iso.org/standard/63500.html.

International Telecommunication Union. (2022). Measuring digital development: Facts and figures 2022. https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx.

Jacobsen, J., & Meyer, L. (2017). *Praxisbuch Usability und UX* (1st ed.). Rheinwerk Verlag.

Janssen, M., Brous, P., Estevez, E., Barbosa, L. S., & Janowski, T. (2020). Data governance: Organizing data for trustworthy artificial intelligence. *Government Information Quarterly, 37*(3), Article 101493. https://doi.org/10.1016/j.giq.2020.101493

Janssen, M., Charalabidis, Y., & Zuiderwijk, A. (2012). Benefits, adoption barriers and myths of open data and open government. *Information Systems Management, 29*(4), 258–268. https://doi.org/10.1080/10580530.2012.716740

Kassen, M. (2022). Blockchain and e-government innovation: Automation of public information processes. *Information Systems, 103*, Article 101862. https://doi.org/10.1016/j.is.2021.101862

Krug, S. (2014). *Don't make me think, revisited: A common sense approach to web usability* (3rd ed.) New Riders.

Law Reform Commission of Ireland. (2020). *Accessibility of legislation in the digital age.* LRC 125–2020.

Lederer, B. (2015). Open Data: Informationsöffentlichkeit unter dem Grundgesetz. In , *Vol. 1. In Internetrecht und Digitale Gesellschaft.* Duncker & Humblot.

Linåker, J., & Runeson, P. (2021). How to enable collaboration in open government data ecosystems: A public platform provider's perspective. *Journal of E-Democracy and Open Government, 13*(1), 1–30. https://doi.org/10.29379/jedem.v13i1.634

Liu, Z. (2004). Perceptions of credibility of scholarly information on the web. *Information Processing & Management, 40*(6), 1027–1038. https://doi.org/10.1016/S0306-4573(03)00064-5

LTO. (2021, July 29). Digitale Gesetzesveröffentlichung verzögert sich. Legal Tribune Online. https://www.lto.de/recht/nachrichten/n/digitale-veroeffentlichung-gesetze-deutschland-verzoegert-sich/.

Malodia, S., Dhir, A., Mishra, M., & Bhatti, Z. A. (2021). Future of e-government: An integrated conceptual framework. *Technological Forecasting and Social Change, 173*, Article 121102. https://doi.org/10.1016/j.techfore.2021.121102

Mäntymäki, M., Islam, A. K. M. N., & Benbasat, I. (2020). What drives subscribing to premium in freemium services? A consumer value-based view of differences between upgrading to and staying with premium. *Information Systems Journal, 30*(2), 295–333. https://doi.org/10.1111/isj.12262

Mast, T. (2022). Gesetzespublizität im Zeitalter der Vernetzung. *Zeitschrift für Gesetzgebung. Vierteljahresschrift für staatliche, kommunale und europäische Rechtsetzung, 37*(1), 35–76.

Mertens, P., Bodendorf, F., König, W., Schumann, M., Hess, T., & Buxmann, P. (2017). *Grundzüge der Wirtschaftsinformatik* (12th ed.). Springer. https://doi.org/10.1007/978-3-662-53362-8

Mitee, L. E. (2017). Towards enhanced public access to legal information: A proposal for official networked one-stop legal information websites. *European Journal of Law and Technology, 8*(3), 1–38.

Möller, T. M. J. (2021). *Juristische Methodenlehre* (4th ed.). C.H.Beck.

Nielsen, J. (2012, January 3). *Usability 101: Introduction to usability.* Nielsen Norman Group. https://www.nngroup.com/articles/usability-101-introduction-to-usability/.

Nielsen, J., & Loranger, H. (2006). *Web usability (I. Kommer & C. Kommer, Trans.).* Addison-Wesley.

Nishikawa-Pacher, A., & Hamann, H. (2023). Is every law for everyone? Assessing access to National Legislation through official legal databases around the world. *Oxford Journal of Legal Studies, 1–24.* https://doi.org/10.1093/ojls/gqac032

Open Knowledge Foundation. (2022). Open Definition 2.1. Open Definition - Defining Open in Open Data, Open Content and Open Knowledge. https://opendefinition.org/od/2.1/en/.

Peruginelli, G. (2016). Law belongs to the people: Access to law and justice. *Legal Information Management, 16*(2), 107–110. https://doi.org/10.1017/S1472669616000268

Peruginelli, G., Conti, S., & Fioravanti, C. (2021). COVID-19 and digital library services: An overview on legal information. *Digital Library Perspectives, 37*(1), 65–76. https://doi.org/10.1108/DLP-07-2020-0064

Publications Office of the European Union. (2016). Directive (EU) 2016/2102 of the European Parliament and of the council of 26 October 2016 on the accessibility of the websites and mobile applications of public sector bodies. *Official Journal of the European Union, L327*(1).

Publications Office of the European Union. (2017). Council conclusions of 6 November 2017 on the European legislation identifier. *Official Journal of the European Union, C441*(8).

Publications Office of the European Union. (2018). *ELI, the European legislation identifier: Good practices and guidelines* (2nd ed.). https://doi.org/10.2830/44907

Publications Office of the European Union. (2019, May 14). About ELI. https://eur-lex.europa.eu/eli-register/about.html.

Reiling, D., & Contini, F. (2022). E-justice platforms: Challenges for judicial governance. *International Journal for Court Administration, 13*(1), 6. https://doi.org/10.36745/ijca.445

Richter, H. (2017). "Open Government Data" für Daten des Bundes. *Neue Zeitschrift Für Verwaltungsrecht, 36*(19), 1408–1413.

de Róiste, M. (2013). Bringing in the users: The role for usability evaluation in eGovernment. *Government Information Quarterly, 30*(4), 441–449. https://doi.org/10.1016/j.giq.2013.05.007

Sagar, K., & Saha, A. (2017). Qualitative usability feature selection with ranking: A novel approach for ranking the identified usability problematic attributes for academic websites using data-mining techniques. *Human-centric Computing and Information Sciences, 7*(1), 29–52. https://doi.org/10.1186/s13673-017-0111-8

Shehzad, H. M. F., Ibrahim, R. B., Yusof, A. F., Khaidzir, K. A. M., Iqbal, M., & Razzaq, S. (2021). The role of interoperability dimensions in building information modelling. *Computers in Industry, 129*, Article 103444. https://doi.org/10.1016/j.compind.2021.103444

Sheng, H., Lockwood, N. S., & Dahal, S. (2013). Eyes don't lie: Understanding users' first impressions on websites using eye tracking. In S. Yamamoto (Ed.), *Human interface and the management of information. Information and interaction design* (pp. 635–641). Springer. https://doi.org/10.1007/978-3-642-39209-2_71.

Stvilia, B., Gasser, L., Twidale, M. B., & Smith, L. C. (2007). A framework for information quality assessment. *Journal of the American Society for Information Science and Technology, 58*(12), 1720–1733. https://doi.org/10.1002/asi.20652

Tangi, L., Janssen, M., Benedetti, M., & Noci, G. (2021). Digital government transformation: A structural equation modelling analysis of driving and impeding factors. *International Journal of Information Management, 60*, Article 102356. https://doi.org/10.1016/j.ijinfomgt.2021.102356

Triebel, V. (2008). Kampf um das anwendbare Recht: Offener Brief eines Anwalts an die Bundesjustizministerin. *Anwaltsblatt, 58*(5).

Venkatesh, V., Hoehle, H., & Aljafari, R. (2017). A usability study of the obamacare website: Evaluation and recommendations. *Government Information Quarterly, 34*(2), 199–210. https://doi.org/10.1016/j.giq.2017.01.003

Vetrò, A., Canova, L., Torchiano, M., Minotas, C. O., Iemma, R., & Morando, F. (2016). Open data quality measurement framework: Definition and application to open government data. *Government Information Quarterly, 33*(2), 325–337. https://doi.org/10.1016/j.giq.2016.02.001

W3C Working Group. (2013). 5 Star linked open data. In B. Hyland, G. Atemezing, M. Pendleton, & B. Srivastava (Eds.), *Linked data glossary*. https://www.w3.org/TR/ld-glossary/#x5-star-linked-open-data.

Wagner, G. (2018). Rechtsstandort Deutschland im Wettbewerb. Impulse für Justiz und Schiedsgerichtsbarkeit. *Juristen Zeitung, 73*(7), 348–349. https://doi.org/10.1628/002268818X15186932911838

Wand, Y., & Wang, R. Y. (1996). Anchoring data quality dimensions in ontological foundations. *Communications of the ACM, 39*(11), 86–95. https://doi.org/10.1145/240455.240479

Wang, J., Liu, Y., Li, P., Lin, Z., Sindakis, S., & Aggarwal, S. (2023). Overview of data quality: Examining the dimensions, antecedents, and impacts of data quality. *Journal of the Knowledge Economy*. https://doi.org/10.1007/s13132-022-01096-6

Wang, R. Y., & Strong, D. M. (1996). Beyond accuracy: What data quality means to data consumers. *Journal of Management Information Systems, 12*(4), 5–33. https://doi.org/10.1080/07421222.1996.11518099

Weber, R. H., Laux, C., & Oertly, D. (2016). *Datenpolitik als Rechtsthema: Agenda für Open Government Data* (1st ed.). Schulthess Verlag.

Wissenschaftliche Dienste des Deutschen Bundestages. (2009). Elektronische Verkündung von Rechtsnormen. In *Ausarbeitung WD 3–3000 - 146/09*.

Yoon, A., & Copeland, A. (2020). Toward community-inclusive data ecosystems: Challenges and opportunities of open data for community-based organizations. *Journal of the Association for Information Science and Technology, 71*(12), 1439–1454. https://doi.org/10.1002/asi.24346

Youngblood, N. E., & Mackiewicz, J. (2012). A usability analysis of municipal government website home pages in Alabama. *Government Information Quarterly, 29*(4), 582–588. https://doi.org/10.1016/j.giq.2011.12.010

Zhang, R., Ai, Q., Wu, Y., Ma, Y., & Liu, Y. (2023). Diverse legal case search. http://arxiv.org/abs/2301.12504.