

Making the Case for Evidence-based Standardization of Data Privacy and Data Protection Visual Indicators¹

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Abstract. Lately, icons have witnessed a growing wave of interest in the view of enhancing transparency and clarity of mandated disclosures about data processing practices. Although benefits in terms of comprehensibility, noticeability, navigability of the information can be expected, they should also be supported by decisive empirical evidence about the efficacy of the icons in specific contexts. Misrepresentation, oversimplification, and improper salience of certain aspects over others are omnipresent risks that can drive data subjects to wrong conclusions. Cross-domain and international standardization of visual means also poses a serious challenge: if on the one hand developing standards is necessary to ensure widespread recognition and comprehension, each domain and application presents unique features that can be hardly established, and imposed, in a top-down manner. This article critically discusses the above issues and identifies relevant open questions for scientific research. It also provides concrete examples and practical suggestions for researchers and practitioners that aim to implement transparency-enhancing icons in the spirit of the General Data Protection Regulation (GDPR).

Keywords: Icons, Graphical symbols, Pictograms, Data protection, Privacy, Transparency, GDPR, Standard, Security, Usability, ISO, Compliance.

1. Introduction

Article 12(7) of the General Data Protection Regulation (GDPR) provides for standardized icons as means to implement the principle of transparency in the mandatory disclosures about personal data processing. Given that privacy notices are usually unreadable, incomprehensible, and unnavigable,² the adoption of visual indicators can indeed be a viable solution to provide data subjects with meaningful information. A visual summary of data processing and data protection operations could attract individuals' attention to usually disregarded information and even help them choose one service over one other. Icons could even be an incentive for companies to comply with legal requirements, since controllers operating questionable data processing practices would presumably abstain from prominently showing such practices. Similarly, data controllers who do not exhibit the icons would be easily distinguishable from those that do and perhaps would even be perceived as less transparent, thus less compliant, service providers.

This article is structured around the following research questions:

- Section 2: What meanings can icons convey and what aim(s) should they further?

¹ Sections 2.2 and 5 of this article are based on Rossi & Lenzini (forthcoming) to which we address the reader for a comprehensive discussion.

² For a summary of the structural problems of privacy policies, see Rossi et al., 2019.

- Section 3: To which extent do visual indicators promote or, on the contrary, hamper users' understanding? Why?
- Section 4: What does the standardization of a set of a set of icons entail?
- Section 5: What are the gaps in the current research on privacy and data protection icons? What relevant icon properties should be considered?
- Section 6: Which open questions need to be answered to support the EU standardization of one set of icons?

2. Icons as Signs

2.1 Definitions and Nature of Pictograms

“A pictogram is an image created by people for the purpose of quick and clear communication without language or words, in order to draw attention to something.” (Abdullah & Hübner, 2006, p. 24)

This definition highlights four fundamental aspects of the nature of pictograms³ that impact their design and use. First, pictograms are created artificially, i.e., their meaning is not instinctively understood, but must be learned. This is why designers should attempt to maximise the self-explanatory character of graphical symbols and, e.g., resort to typical representations that can be associated with the intended meaning through common experience. Second, pictograms should be easily recognizable, in terms of legibility of the design. Third, pictograms should be understood across cultures and languages without the need of linguistic explanations. Fourth, icons are not meant to illustrate notions, but rather fulfil the functions delineated in the following section.

2.2 Decoding Icon Meaning

2.2.1 Primary and secondary meanings

When the goal is maximising the comprehensibility of a graphical sign by a wide audience, designers should promote its most literal and common meaning. However, the sign can also recall intended and unintended secondary meanings. Such interpretations are not only determined by the sender, but also by the receiver. What an image represents does not necessarily coincide to what it means and, therefore, it can be prone to multiple readings.

The padlock in Figure 1 exemplifies this distinction. The icon indicates that the connection with that website is secure⁴ and that the user is actually connected to the website visible on the URL bar. In this case, the padlock is meant to be a mark of trustworthiness. The absence of the padlock suggests to the user to be cautious e.g., about sharing credit card data. However, the padlock does not provide any explanation: its meaning is either learned

³ The existing literature, the professional practice, and EU legislations variously promote an interchangeable use of the terms "pictograms", "icons", and "graphical symbols". For the sake of simplicity, we also adhere to this choice.

⁴ More precisely, it indicates that the website has implemented the Hypertext Transfer Protocol Secure (HTTPS).

through repeated exposures (i.e., experience) or is explored through a textual explanation (i.e., the anchorage).



Figure 1. The use of a padlock icon in a browser window

2.2.2 Icon functions

Unlike other visual means (e.g., comics, images, diagrams), pictograms do not aspire to explain facts. Abdullah & Hübner (2006) mention three main functions of icons:

1. Indicative: they give directions, inform about a state, or signal the existence of an entity without attempting to influence the behaviour of the message receiver;
2. Imperative: they aim to induce a desired behaviour or discourage an undesired behaviour;
3. Suggestive: they attempt to influence the feeling of the receiver to trigger a certain reaction, but they do not impose any course of action.



Figure 2. Examples of graphical symbols having indicative function (on the left: scenic viewpoint); imperative function (at the centre: smoking prohibited); and suggestive function (on the right: inflammable material).

2.2.3 Context of use

The process of icon interpretation hinges on many factors: “meanings are widely variable subject to who is interpreting them and where and when such interpretation takes place” (Noble & Bestley 2016, p. 70). Decoding meanings is not only subject to the characteristics of the receiver (e.g., age, knowledge, education, culture, location and experience), but it is also conditioned by contextual factors. Specifically, there are three different contexts that influence the interpretation of icons (Zender, 2013):

1. immediate context, i.e., the traits and symbols composing an icon;
2. environmental, i.e., the setting where the graphical symbol is placed;
3. proximate, i.e., the field of interaction of one icon within a system of icons (e.g., an icon set).

In Figure 1, for instance, the icon is made of a green, closed padlock and is meant to signify within a URL bar. Moreover, it interacts with the “i” icon next to it, that encloses the anchorage explaining the padlock meaning. In this case, the padlock has a suggestive function: it suggests to the receiver that she can trust the connection to securely send data. If one of these conditions would change (e.g., the icon was displayed on a sign next to a gate), decoding the padlock’s meaning would certainly produce different results. Indeed, as it will be argued in Section 4.2, to evaluate whether an

icon is comprehensible, it is fundamental to provide contextual elements that disambiguate its meaning.

3. Visual Security Indicators: What Can Be Learnt?

The established research and practice about risk perception and communication, specifically about (standardized) visual security indicators, can provide valuable lessons for the design and implementation of data protection icons. Risk communication concerns the nature, the likelihood and the consequences of dangers and has three main goals: 1) advancing or changing knowledge and attitudes 2) modifying behaviour; 3) facilitating decision-making (Nurse et al., 2011). Such functions largely overlap with the functions of pictograms laid out in Section 2.2.1.

Both in the physical and digital worlds, security indexes are meant to facilitate understanding and promote informed security judgements by e.g., enhancing the perception of risk (Nurse et al., 2011) and by warning against possible dangers and their nefarious consequences. Visual design can attract and retain attention, improve understanding and make risks more tangible (Creese & Lamberts, 2009). However, inadequate risk communication can lead to lack of understanding and poor decisions (Nurse, 2013), e.g., due to sloppy or complex design and wrong prioritization of information.

Studies reveal that security indicators can be confusing (Whalen and Inkpen, 2005) or totally ignored when taking decisions, even in sensitive contexts (Schechter et al. 2007). For instance, although the padlock is a well-established security metaphor, it was demonstrated that it can be misunderstood in network settings (Jeske et al., 2014; Ferreira et al., 2015) and act as an inhibitor, instead of as a promoter, of trust. Most secure messaging applications consistently use the padlock symbol to indicate encrypted messages, but inconsistently assign a color code to it. Moreover, different applications indicate unencrypted communications in conflicting ways. The same lack of coherence is observed for signed and unsigned e-mails and for corrupted encryption (Lausch et al. 2017).

Finding the right manner to communicate risk with graphical cues can be challenging, because it needs to accommodate at once uniformity and specificity. It means determining what is the most appropriate graphical representation for the intended goal and the intended users (e.g., their level of knowledge, expertise, education, attitudes and beliefs about the security issue). Appropriate design choices are fundamental when non-expert individuals are faced with unfamiliar decisions, which is typically the case in privacy and security decision-making. Hence, in situations entangling possible dangers, the presentation of information should be as simple and user-friendly as possible (Pattinson & Anderson, 2007).

This is why standardization efforts can be useful, i.e., to expunge inconsistencies and define a common and recognizable visual vocabulary.

For example, the standard ANSI Z535.3-2011⁵ codifies a combination of symbols, colors, and words for safety symbols, which corresponds to the probability and severity of harm derived by non-adherence to the safety message (Hall et al., 2006). International standard ways to represent warning information can enhance the visibility (Wogalter et al., 2006), recognition, and even comprehension (Wogalter et al., 1997) of the message, although mixed evidence exists for what concerns actual compliance with safety instructions (Huntley-Fenner et al., 2007).

4. Standardizing Codes of Icons

4.1 Combining Rules and Use

As the last examples have shown, the interpretation process has a non-deterministic nature. For this reason, standardised graphical symbols are meant to establish a common code that crosses languages and literacy levels to become universally recognizable when consistently employed. But what does it mean to standardize a set of icons, as established by the GDPR? We argue that it means combining a norm established by an invested authority prescribing icon design and implementation, together with the actual widespread and uniform use of that design.

In some domains, regulations impose specific rules on how to design and adopt graphical symbols (see Section 4.3). In the legal framework created by the GDPR, the European Commission is called to adopt delegated acts to determine the information to be displayed by the icons and the procedures for providing them (Article 12.8 GDPR). Since the Commission should undertake consultations at the expert level to inform its decisions (Efroni et al., 2019), we expect that evidence-informed proposals of icons will contribute to the debate.

Widespread and uniform use of the icons across domains and applications is also a key factor of standardization. Taking graphical user interfaces as examples, the establishment of standards has raised from practice rather than being the official outcome of a standardization process. Icons like the geolocation pin and the security padlock are *de facto* standards because they are immediately recognizable for vast amounts of users thanks to their homogeneous usage, often stimulated by influential corporations. For such reasons, stylistic considerations deserve scrupulous attention (see Section 6).

Therefore, norms regulating a certain design become effective only through a coherent and extensive usage of the icons. Conversely, concrete uses can gradually become the accepted norm. Hence, rules and practice do not exclude, but rather complement, each other to bolster the process of standardization.

⁵ Criteria for Safety Symbols, available at: <https://webstore.ansi.org/Standards/NEMA/ANSIZ5352011R2017-1668873> (accessed: 13 October 2019).

4.2 Standardized Icon Languages

Icons are thought to be universal codes of communication that successfully overcome language barriers. For instance, most traffic signs guide drivers on the streets no matter their origin. Such wayfinding system⁶ has been systematized in specific combinations of symbols, forms, and colors, with a minimal use of lettering to achieve cultural neutrality and thereby avoid misunderstandings on the road (Abdullah & Hübner, 2006). Similarly, the system of public symbols that guides passengers and pedestrians through transportation facilities⁷ (like airports) was designed to communicate a wide range of complex messages to people of different ages and cultures. Lastly, certain ISO standards regulate the visual communication of safety and public information matters.⁸

4.3 European Standardization of Graphical Symbols

The GDPR is only one of many European regulations suggesting a standard graphical language to straightforwardly inform individuals and help them to compare and contrast similar products, thereby inducing more informed purchase choices. For instance, the EU has imposed standard labelling schemes for hazardous substances⁹, energy consumptions of appliances¹⁰, CO₂ emissions,¹¹ fuel consumption,¹² and food¹³. The Consumer Rights Directive¹⁴ even includes a standard contractual form complemented with

⁶ Harmonized by the Vienna Convention on Road Signs and Signals, 1968. Available at: https://www.unece.org/fileadmin/DAM/trans/conventn/Conv_road_signs_2006v_EN.pdf (accessed: 13 October 2019)

⁷ Developed in 1979 by AIGA and US Department of Transportation. Available at: <https://www.aiga.org/symbol-signs> (accessed: 13 October 2019).

⁸ For a complete list, see ICS 01.080.10 Public information symbols. Signs. Plates. Labels. Including safety signs, safety colours, etc. Available at: <https://www.iso.org/ics/01.080.10/x/> (accessed: 13 October 2019).

⁹ Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006. *OJ L 353, 31.12.2008, p. 1–1355.*

¹⁰ Commission Delegated Regulation 1060/2010 of Sept. 28, 2010, Supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household refrigerating appliances, *O.J. (L314) 17.*

¹¹ Directive 1999/94/EC of the European Parliament and of the Council of 13 December 1999 relating to the availability of consumer information on fuel economy and CO₂ emissions in respect of the marketing of new passenger cars. *OJ L 12, 18.1.2000, p. 16–23.*

¹² Regulation (EC) No 1222/2009 of the European Parliament and of the Council of 25 November 2009 on the labelling of tyres with respect to fuel efficiency and other essential parameters. *OJ L 342, 22.12.2009, p. 46–58.*

¹³ Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004. *OJ L 304, 22.11.2011, p. 18–63.*

¹⁴ Directive 2011/83/EU of the European Parliament and of the Council of 25 October 2011 on consumer rights, amending Council Directive 93/13/EEC and Directive 1999/44/EC of the European Parliament and of the Council and repealing Council Directive 85/577/EEC and Directive 97/7/EC of the European Parliament and of the Council. *OJ L 304, 22.11.2011, p. 64–88.*

icons that can be used to present the characteristics of products to consumers.

There are similarities between the GDPR requirements and other EU laws, e.g., the Regulation on the provision of food information to consumers¹⁵ (hereafter RPFIC). Article 9 RPFIC provides for a list of information items that must be displayed mandatorily and must be written in plain language and legible fonts. The European Commission can establish criteria to replace certain words and numbers with pictograms, if evidence of uniform consumer understanding exists (Article 9(3) RPFIC). Visual means are also allowed for nutrition factors, as long as they are “based on sound and scientifically valid consumer research and do not mislead the consumer” (Article 35(1.a) RPFIC). Pictograms should be easily visible, clearly legible and, where appropriate, indelible.

Hence, analogous intentions are expressed in EU legislations: similar to labels guiding consumers in their consumption choices, standardised data protection icons would constitute a common and regulated pictographic system through which data controllers declare important aspects of their data practices. If such system would become consistently used and thereby universally recognizable, it could inform data subjects during relevant decisions about the disclosure of their personal data. Although privacy labels corresponding to privacy-friendliness indexes have also been established,¹⁶ current academic research focuses on pictographic approaches (explored in Section 5.1).

4.4 Design brief for Standardized Graphical Symbols

The creation and implementation of standardized pictograms in disparate settings can even be directed by guidelines and requirements. Their goal is to encourage an orderly and visually consistent adoption (Hall et al., 2006) to bolster icon recognition and comprehension.

For example, ISO 28564-3:2019¹⁷ is composed of design principles, requirements, guidelines, and illustrative examples for both the design and the use of public information signs. During the design planning phase, it is recommended to make a brief defining: the environmental context where the symbol should appear; its requirements and constraints, and the possible positioning of the symbol; the information to be visualized, given the tasks of the intended audience and other user requirements. Besides, the ISO establishes relevant icon design principles like legibility (i.e., spacing and contrast); conspicuity (i.e., noticeability); consistency (i.e., visual uniformity); simplicity (i.e., minimum number of elements necessary for

¹⁵ Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004. *OJ L 304*, 22.11.2011, p. 18–63.

¹⁶ For a review, see Reidenberg et al., 2019.

¹⁷ Public information guidance systems — Part 3: Guidelines for the design and use of information index signs. Available at: <https://www.iso.org/standard/67692.html> (accessed 13 October 2019).

comprehension); and inclusivity (i.e., readability for all audiences). These criteria overlap the transparency requirements illustrated in Section 4.3.

ISO 22727:2007¹⁸ even adds a checklist for designers, where it recommends to *a priori* define concise meanings and the function of the icon, and to identify accepted alternative meanings and possible unintended meanings. Moreover, it invites to reason on the actual need for a new symbol and on its interplay with the proximate context. It also suggests to identify the intended audience and its characteristics, and to validate with them the icon design, by recurring to ISO testing procedures.¹⁹

5. A Code of Icons for Data Privacy and Data Protection

5.1 State of the art

Although the existence of pictograms to inform data subjects precedes the GDPR, Article 12(7) of this Regulation has provided considerable momentum to the idea. Existing and arising icon systems that aim to transparently communicate notions of privacy and data protection to users serve various functions and represent variegated objects. We build on the classification previously proposed in Rossi & Lenzini (forthcoming) to identify:

1. Icons with indicative function (i.e., inform users about the existence of data processing²⁰):
 - (a) Concepts referring to personal data processing (Fig. 3a);
 - (b) Statements about the presence (or absence) of personal data processing (Fig. 3b);
2. Icons with suggestive function (i.e., nudge users towards or away from self-disclosure):
 - (a) Indication of the lawfulness or fairness of data processing (Fig. 3c);
 - (b) Riskiness of data processing (Fig. 3d).

¹⁸ Graphical symbols — Creation and design of public information symbols — Requirements. Available at: <https://www.iso.org/standard/41091.html> (accessed 13 October 2019).

¹⁹ ISO 9186-1:2014 Graphical symbols — Test methods — Part 1: Method for testing comprehensibility, available at: <https://www.iso.org/standard/59226.html> (accessed 13 October 2019); ISO 9186-2:2008 Graphical symbols — Test methods — Part 2: Method for testing perceptual quality, available at: <https://www.iso.org/standard/43484.html> (accessed 13 October 2019); ISO 9186-3:2014 Graphical symbols — Test methods — Part 3: Method for testing symbol referent association, available at: <https://www.iso.org/standard/59882.html?browse=tc> (accessed 13 October 2019).

²⁰ Art. 4(1.b) GDPR: "‘processing’ means any operation or set of operations which is performed on personal data or on sets of personal data, whether or not by automated means, such as collection, recording, organisation, structuring, storage, adaptation or alteration, retrieval, consultation, use, disclosure by transmission, dissemination or otherwise making available, alignment or combination, restriction, erasure or destruction".

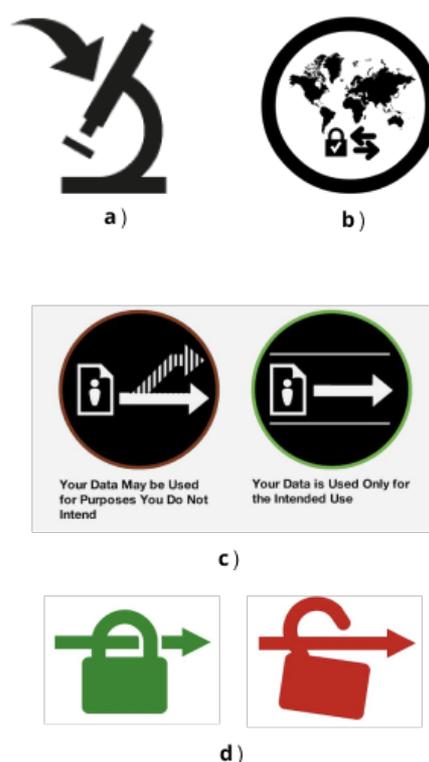


Figure 3. Existing privacy icon sets depicting: a) the concept of research purposes²¹; b) a statement about the existence of adequacy transfer of data outside of the EU²²; c) binary statements that warn or, on the contrary, reassure data subjects about the permissible use of their data²³; d) two alternative icons indicating that the data transfer is either encrypted (left) or unencrypted (right)²⁴

The existing icon sets do not aspire to ban or coerce user behaviour²⁵. However, icons can arguably have an imperative (i.e., normative) function towards data controllers: if there are discrepancies between the pictorial disclosures and the actual data processing practices, controllers might be accused of deceptive practices.

²¹ DaPIS. Available at: <http://gdprbydesign.cirsfid.unibo.it/dapis-2/> (accessed 13 October 2019). See also Rossi & Palmirani, 2019.

²² Privacy Tech, Privacy Icons. Available at: <https://www.privacytech.fr/privacy-icons/> (accessed 13 October 2019).

²³ Mozilla Privacy Icons, alpha release. Available at: <https://bigthink.com/design-for-good/mozillas-privacy-icons-a-visual-language-for-data-rights> (accessed 13 October 2019). See also the beta release at https://wiki.mozilla.org/Privacy_Icons (accessed 13 October 2019).

²⁴ Specht-Riemenschneider & Bienemann, 2019.

²⁵ Even though there are icon sets used in specified contexts with such an objective. E.g., the responsible research and data management agreement available at: https://docs.synapse.org/assets/downloads/synapse_oath.pdf (accessed 6 January 2020).

5.2 Critiques

Some have raised critical concerns against pictographic approaches. For instance, Reidenberg (2019, p. 19) argues that it is challenging to “translate broad privacy policy language representing intricate and nuanced data practices into simple, clear, concise, and accurate summaries encapsulated in a final visual representation.” Mondschein (2016) maintains that a visual translation would affect the quality and explanatory nature of data privacy disclosures. Indeed, predefined icon sets have a way more limited range of expression than the infinite combinations offered by language and cannot be easily adapted to new uses, contexts, and needs.

Moreover, due to incorrect icon interpretation, data subjects might unintentionally give consent to privacy-invasive practices. Such danger is real: user studies indeed demonstrate that icon reception does not always correspond to the intended meaning (Iannella & Finden, 2010; Graf et al., 2011; Pettersson, 2014; Rossi & Palmirani, 2019). What are the reasons of such discrepancy? Although many factors influence interpretation, context is fundamental. Yet, this element has not been often properly considered during icon design and evaluation. On the one hand, disregarding context means designing general icons that can be successfully implemented into an unforeseeable variety of environments. On the other hand, context can influence what the icon represents, how this is represented, and even how the icons’ efficacy is assessed.

5.3 The importance of context

Contextual cues orientate the interpretation of graphical symbols (Tijus et al., 2007): sign systems are conceived, developed, and implemented as integral part of other sign systems that concur to meaning disambiguation. Icon comprehensibility must therefore be studied in the intended setting to achieve reliable results. Otherwise, negative results would erroneously indicate that further icon design and testing is indispensable (Wogalter, 2014). This is why ISO testing procedures (i.e., ISO 9186:1-3) recommend to provide a written or visual description of the actual usage conditions and the environment where the pictogram is meant to appear.

As for what concerns the GDPR icons, they can be usefully integrated in privacy policies, product packaging, browser plug-ins, cookie banners, app permissions, interfaces for consent and identity management tools, and notices in public spaces. In each context of use, pictograms fulfil specific functions, beyond ensuring comprehension. For example, icons in public spaces can attract attention and prominently show that certain data are being processed. In privacy notices, icons can facilitate document navigation and understanding (Behavioural Insights Team, 2019). They can even improve awareness of the consequences of consent,²⁶ by emphasising the risks derived from data-gathering activities. These interventions aim not only to reduce written information in privacy notices²⁷ or augment their

²⁶ This is the approach elected by Efroni et al., 2019 and by von Grafenstein & Jakobi, 2019.

²⁷ As in the reading proposed by the Article 29 Working Party (2018, p. 25): “Clearly, the purpose of using icons is to enhance transparency for data subjects by potentially reducing the need for vast amounts of written information to be presented to a data subject.”

comprehensibility, but to variously enhance the transparency of communication about data practices.

5.4 Icon Properties

5.4.1 Icon properties and GDPR requirements

Article 12(7) provides that the information disclosed to data subjects “may be provided in combination with standardised icons in order to give in an easily visible, intelligible and clearly legible manner, a meaningful overview of the intended processing. Where the icons are presented electronically, they shall be machine-readable.” The requirements set forth by the GDPR arguably correspond to the properties recapitulated in Table III²⁸. A holistic methodology that integrates these dimensions has not been defined yet.

Property	Definition
Visibility	Capacity to stand out from other stimuli in the immediate environment.
Legibility	Ease of identification of the shapes composing the icon.
Comprehensibility	Ease of understanding of an icon's meaning. Impacted by several dimensions, like legibility, familiarity, concreteness, style, complexity, etc.
Culture-independence	Extent to which an icon is comprehensible to more than one culture or linguistic community.
Style	The way an icon is designed.
Quality	Extent to which an icon looks professional.
Semantic transparency	Extent to which an icon straightforwardly communicates its meaning and is not misleading.
Completeness of the icon set	Capacity of representing all the intended information items.
Machine-readability	Ability to be read or interpreted by software applications.

Table I. Our interpretation of the legal requirements in Article 12(7)GDPR and their translation into functional requirements for icon design.

5.4.2 Comprehensibility

Whether the existing privacy icon sets fulfil their intended communicative goal remains unclear. The few existing studies²⁹ mainly focused on immediate comprehensibility, which depends on a variety of factors, though. For instance, ease of recognition of the shapes composing the pictogram (i.e., legibility) and previous knowledge (i.e., familiarity) are key indexes of understandability. Expectations about forthwith recognition of

²⁸ For a thorough discussion about the correspondence between icon properties and GDPR requirements, we address the reader to Rossi & Lenzini, forthcoming.

²⁹ Graf et al., 2011; Iannella & Finden, 2010; Pettersson, 2014; Rossi & Palmirani, 2019.

the meaning at first exposure are misplaced, unless the icon represents a common and concrete object. That is why, ease of learning and recognition of a set of pictograms and their meanings over time can be relevant dimensions to study.

6. Discussion

This article has explored a few aspects in need of clarification to pave the way to the design and adoption of a standardized transparency-enhancing icon set at the European level for data-gathering applications. The standardization will be key to ensure widespread adoption by organizations and ease of interpretation by users. Kelley et al. (2010) demonstrated that a nutrition label approach applied to online privacy policies enhances accuracy and speed of information finding, with improved user enjoyment. Similarly, Duke et al. (2016) showed that standardized structured formats for insurance product information documents improve the comprehensibility of complex information. These studies indicate that standardization and visualization of complex legal-technical information can benefit non-expert readers. However, the open questions are still many.

Existing and emerging attempts to visualize the data protection sphere diverge for many reasons, i.e., in the choice of visualized concepts and the function icons serve. A phase of divergent thinking is necessary to conceive multiple solutions and evaluate which responds best to the transparency challenge. Yet, the following convergent phase shall rigorously compare the solutions and thereby inform the standardization process in an evidence-based manner. Since the universe of meanings that can be signified to users is potentially infinite, the definition of an icon set inevitably happens through a selection and prioritization of concepts. Such choice risks to give visibility to certain aspects while condemning other aspects to disregard. The selection must be supported by convincing arguments, even though icons are not meant to be as expressive as legal terms.

Furthermore, the standardization risks to immutably fossilise a complex and rapidly evolving data processing reality. Such crystallization should consider that data-gathering domains are blossoming and each presents its own challenges. It remains to be proved whether and how it would be possible to use the same set of icons to express aspects related to the processing of, e.g., genetic data for research purposes and purchase history for marketing purposes. Similarly, whether the same set of icons can keep its meaningfulness in multiple contexts of use (e.g., public space, browser, app), with different functions (e.g., inform, raise awareness) and at different moments (e.g. before purchase, after registration) is also open to debate. To serve broad scopes and be widely implementable across sectors, the icon set might need to lose its context-specificity in favour of more abstract concepts. However, such abstractness would impact ease of recognition.

To solve the restricted range of expression of an icon set, an explorable solution could be the design of a limited set of basic elements that can be differently combined through the root/referent icon design method.³⁰ In this approach, the root is a constant symbol representing a certain category,

³⁰ Fontaine et al., 2010.

which is specified by the referent (see Fig. 4 and 5). Empirical research is needed to indicate strengths and weaknesses of the approach.



Figure 4. The root/referent approach symbolizing different rights of the data subjects. From left to right: right of access, right to erasure, right to data portability, right to be informed. Extracted from DaPIS (Rossi & Palmirani, 2019).



Figure 5. The root/referent approach symbolizing increasing levels of risk severity related to automated decision-making. Our own creation.

We argue that the icon set that will be eventually standardized should be accompanied by design guidelines, examples of applications, and test criteria to ensure correct and uniform adoption by data controllers.³¹ Clear-cut criteria are not only meant to avoid unintentional misjudgements and misplacements, but also deliberate deceptive practices. Besides, establishing transparent and objective criteria for the choice of privacy indicators can strengthen their meaningfulness for users (Reidenberg et al. 2019). This is why, e.g., assigning icons representing data processing risks could be based on Data Protection Impact Assessments, similarly to the scale of severity contained in ANSI Z535 and applied to security indicators.

Nevertheless, since it is necessary that companies with strong brand identities adopt the icon set, it is necessary to determine the extent to which icons can be modified to a specific graphical house style and to different device sizes without impacting their recognizability. This would mean to mandate certain elements, while leaving to organizations a certain latitude about style and implementations. Simultaneously, this freedom should not negatively impact data controllers who intend to implement the icons off the shelf without applying their own style.

A comprehensive testing methodology that integrates the factors mentioned throughout this article is still missing. International standards for the evaluation of graphical symbols (i.e., ISO 9186:1-3) cannot be directly applied because most data protection icons do not represent concrete objects or well-known concepts. Moreover, they are not intended for

³¹ An excellent example in this respect is the documentation of Hablamos Juntos, 2010, aimed at the design, evaluation, and instalment of a visual wayfinding system in healthcare facilities.

specialized or trained audiences.³² Moreover, the existing user studies were carried out in lab-based conditions and might therefore not be representative of in-the-wild behaviour. Hence, before promoting one icon set, it would be pivotal both to carry out extensive investigations about its efficacy in controlled settings and to find out how those findings transfer to real-world scenarios. The first contribution to this end is the foundation of an international consortium of experts and institutions to exchange best practices and compare findings of interdisciplinary research on data protection icons.³³

The usefulness of a discussion on standardized icon systems for the goal of transparency enhancement is not limited to the scope of the GDPR, but can also be applied to other spheres. Several European laws like those mentioned in these pages and others (e.g., the current proposal for an ePrivacy Regulation) promote pictograms to ameliorate consumer-facing information: to what extent and under which conditions this argument is valid has yet to be convincingly substantiated.

7. Conclusions

This article has touched upon a few points that we consider relevant to promote the standardization of a code of transparency-enhancing icons to implement Article 12(7) GDPR at the European level. Section 2 has explored definitions and core elements to interpret the meaning of pictograms, for instance their functions and context of use. Section 3 has summarized a few lessons that can be drawn from previous experiences of design and interpretation of security visual indicators. Section 4 has analysed existing processes for the international standardization of graphical symbols, which are often based on a combination of rules and usage. Section 5 has provided a brief overview of the current debate on data privacy and data protection icons and has highlighted the importance of considering context together with a list of icon properties to determine whether a specific set of icons responds to the legal requirements set forth by the GDPR. Finally, Section 6 has enclosed some tentative answers to the open questions that need to be addressed to further the research about privacy icons.

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³² For a thorough discussion about the inadequacy of the evaluation standards, we address the reader to Rossi & Lenzi, forthcoming.

³³ Privacy Icons Forum: <https://www.privacyiconsforum.eu/> (accessed: 13 October 2019).

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