User Interfaces for Transparency: Could the Digital Product Passport be a case of a fair pattern?

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Abstract

The paper considers the Digital Product Passport as a user interface for transparency. Through a discussion of possible design scenarios, I speculate on how it could be designed to enable both deceptive and fair patterns that support informed decision-making, as well as how it might be misused by companies for greenwashing and misleading users and customers.

Keywords

Regulation, Fair Patterns, Digital Product Passport, Sustainability

1. Introduction

The Digital Product Passport (DPP) represents an ambitious attempt to use digital systems as instruments of environmental policy. By requiring manufacturers to disclose detailed information about the materials, durability, repairability, and environmental impact of their products[1], the DPP aims to support more sustainable consumption and facilitate circular economy practices [1]. This is a rare opportunity to improve sustainability by embedding ethical and transparent design principles directly into user interfaces (UIs).

Yet an important question is whether transparency, on its own, will have a significant impact on behavior. Examples of prior efforts from energy labels [2] and cookie consent banners [3] show that the design of the information matters greatly for users to understand it or use it in line with their preferences, but also that real gains can be achieved (e.g. 3.5% reduction in energy consumption based on re-design of EU energy labels [4]). Without careful attention to how information is presented and how decisions are supported, transparency interfaces can easily miss their intended target.

In this paper, I argue that the DPPs, which are intended to be the opposite of deceptive, will only realize its potential if they are designed in a way that prioritize comprehension, agency, and non-manipulative UI features. To illustrate my case, I speculate on three possible scenarios for the DPP, including risks and potential benefit of these. I end by outlining an ongoing study on UIs of early DPP pilots and an invitation to collaborate.

2. From deceptive to fair patterns?

Research on deceptive patterns has documented a wide range of interface strategies that mislead, confuse, or manipulate users into choices they might not otherwise make (e.g. [5, 6, 7, 8]. These include obstruction, forced action, interface interference, and other techniques that exploit cognitive biases to advance commercial interests. While these harmful practices are increasingly well understood, there is, as de Vries et al. note, "insufficient research effort towards positive examples to follow" [9]. In other

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[1]For this first working plan priorities are: iron and steel; aluminium; textiles, in particular garments and footwear; furniture, including mattresses; tyres; detergents; paints; lubricants; chemicals; energy-related products and ICT products and other electronics[1]

words, we know far more about what designers should avoid than about how they can proactively design for fairness.

Fair patterns have recently been proposed as a constructive counterpart to deceptive patterns [10]. However, it has been argued that the concept of fairness in design patterns is rather complex and depends its evaluation and context [9]. A related concept, "bright patterns" [**?** 11], is described as using the same mechanisms as deceptive patterns (defaults, visual hierarchy, obstruction) but redirects them toward outcomes in benefit of the user. While the terminology for the opposite of a deceptive pattern has not yet settled, I here use the term fair patterns to describe patterns that *support comprehension, enable informed choice, while avoiding coercive or manipulative framings.* This clearly echoes the ambition of the regulation around the DPP: "Among other things, the digital product passport is expected to help customers make informed choices by improving their access to relevant information" [1].

I believe these distinctions are crucial in the context of the DPP. The regulation mandates extensive reporting of different data and information (which is arguable going to be a costly and cumbersome affair), yet remains silent on how such information should be framed, contextualized, or navigated by end-users. Initial work on DPP pilots place a minor focus on the end users interaction with the DPP with only two out of 13 user stories addressing this [12], which is a clear opportunity for HCI to play a role. Put differently, the DPP defines the system-side and data layer but leaves the side of the end-user and interaction layer entirely open. As a result, the success of the DPP probably depends not on disclosure alone but on the patterns through which users encounter, interpret, and act on sustainability information.

Figure 1: Figure 6 from 'User Stories' document for the European DPP system, i.e., interactions between the DPP system and its intended users.[12]. Purple highlight by me.

3. Scenarios

The three scenarios that follow illustrate how the DPP can diverge into very different trajectories depending on the design of the user interface, and each shaped by the incentives and actors involved. This speculation intends to make visible the core claim of this paper: that transparency and appropriate data model alone are insufficient unless the interaction layer is intentionally designed around fair patterns.

3.1. Scenario 1: standardized, outsourced, "cookie-cutter" DPPs

In this scenario, the DPP becomes a highly standardized, low-engagement interface supplied by a small number of dominant service providers. For the economic operating putting a product on the market, the DPP is nothing but a regulative burden where compliance is to be ensured in the cheapest most effective way possible. This development would mirror the evolution of contemporary cookie consent banners. As Nouwens et al. [13] show, the majority of consent interfaces have become outsourced to large consent management platforms, with 67% of cookie UIs provided by these intermediaries. A similar dynamic could easily emerge around DPPs.

On the user side of the equation, this can pan out in multiple ways. If the few dominant service providers adopt fair patterns of their UIs, things will look good for the user. As centralization around few actors, coupled with the choice of service provider predicting compliance [13]. However, the opposite might also be the case, where service providers compete on being best at "greenwashing". Support for this hypothesis partly exists as Toth et al.[14] has demonstrated that configurations processes happening at the larger service providers appears to nudge in the opposite direction of fair. A silver lining to DPP unfolding in this manner is that regulatory enforcement tends to be more straightforward when targeting larger, centralized actors.

Personally, I think this is likely to happen.

3.2. Scenario 2: Tailored, heterogeneous DPPs

In this scenario, companies treat the DPP as an opportunity to differentiate their products and brands in the market. Instead of adopting generic, outsourced solutions, firms invest in tailored DPPs that showcase their sustainability credentials, craftsmanship, repairability or corporate values. In principle, this could promote meaningful transparency as tailored interfaces might present data in ways that are clear, contextualized, and genuinely informative for consumers.

However, this scenario also introduces significant risks. A competitive race to design "compelling" DPPs can quickly blur the line between transparency and persuasion. When sustainability information becomes part of a brand narrative, firms may be incentivized to selectively highlight favorable metrics, deprioritize inconvenient indicators, or frame data through visual and interaction patterns that guide users toward desired interpretations. Unlike Scenario 1 where centralization creates uniformity (which can then go in multiple directions) the decentralized nature of tailored DPPs makes such practices harder to regulate.

This dynamic could resemble patterns of greenwashing and selective reporting. For example, Lifecycle assessments (LCAs) offer multiple methodological levers which can all be tuned to portray a product in a more favorable light. A company might compare a polyester T-shirt and a wool T-shirt by emphasizing the high upfront energy cost of wool while omitting its longer durability, lower washing frequency, and end-of-life biodegradability. When such choices are embedded invisibly in the DPP's interface, users may be nudged toward conclusions that are technically defensible yet substantively misleading.

The interaction design layer further amplifies these risks by subtle persuasive strategies: defaults, selective surfacing of data, overly positive visual storytelling, and interaction flows that foreground marketing claims while burying methodological caveats. Consequently firms may compete on how effectively they can use the DPP to reinforce sustainability narratives—rather than on how accurately or fairly they communicate environmental impacts.

Thus, while tailored DPPs hold real potential for richer, more context-sensitive transparency, they equally open a pathway toward sophisticated forms of greenwashing disguised as user-centered design. This scenario underscores the importance of governing not only what data must be included in a DPP but also how the interface is designed and the data framed.

Personally, I doubt this will happen

3.3. Scenario 3: Intermediated DPPs

In this final scenario, end-users rarely interact with the DPP in its original form. The DPP becomes a background data infrastructure that is accessed, filtered, and repackaged by a wide ecosystem of intermediaries. These could be price- or sustainability-comparison services (e.g. GoodOnYou [15], see fig. 2) repair platforms, procurement systems, and second-hand marketplaces. Rather than scanning a QR code on a product, most people would encounter DPP-derived information only after it has been curated and reframed by these third parties. Furthermore, the legislation specifically mentions a version of such an intermediary:

> *The Commission should set up and maintain a user-friendly and publicly available web portal where stakeholders, such as customers, economic operators and other relevant actors, have access to data included in the digital product passports and the possibility of searching for and comparing data included in those passports in line with their respective access rights specified in the delegated acts setting ecodesign requirements.* [1]

Time will tell whether the commission succeeded in designing a "user-friendly" web portal, but it is not unreasonable to believe in the existence of something similar to the DSA Transparency Database [16], which "allows to track the content moderation decisions taken by providers of online platforms in almost real-time". The European Product Registry for Energy Labelling is a similar example which "primary purpose is to make information about the energy and environmental performance of all models of products bearing the "energy label" readily available" [17].

On the surface, this model could provide real benefits. Overviews and comparisons can simplify complexity, aggregate data across products, and introduce tools that help users consistently understand sustainability impacts. However, if the intermediary has commercial interests they might curate content to increase sales conversions, optimize rankings, or promote preferred brands and partners, much similar to what is seen websites like hotels.com and skyscanner.

One additional challenge in this scenario is accountability. When users largely encounter DPP data through third-party lenses, responsibility for fair pattern design becomes diffuse. Regulators may target manufacturers for data quality, but the most consequential interface decisions will be made elsewhere by retailers, platforms, and service providers who are not the primary subjects of the DPP regulation. A workaround for an unethical economic operator could then be to adhere to the regulation by providing "correct" DPPs and data on product, but influence how they are perceived by the end-user/consumers by a proxy comparison service.

Personally, I believe this scenario is both plausible and can co-exist with the prior two scenarios.

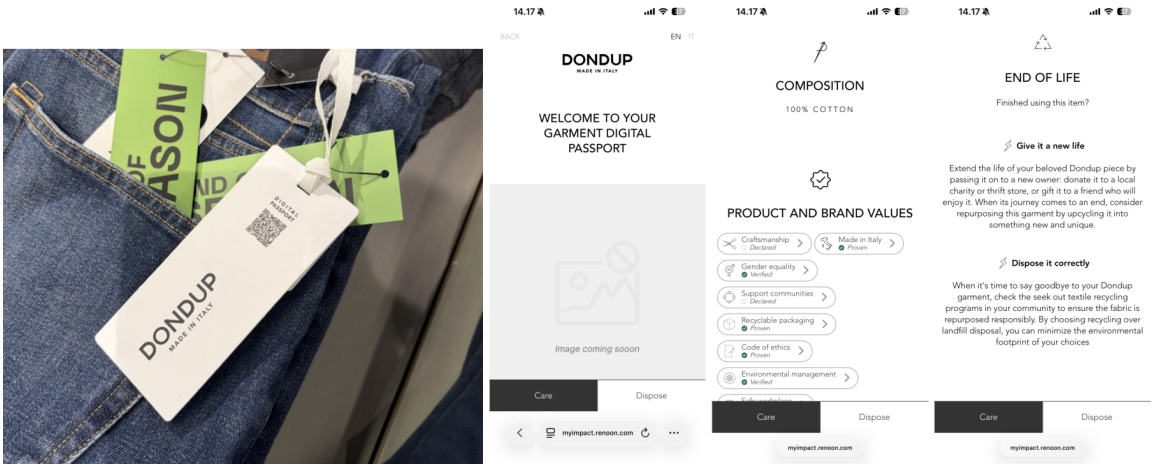

Figure 2: Left: Example of working DPP pilot on a pair of jeans in a store. Right: three screenshots of the DPP connected to the piece of garment.

4. Current work

We[2] are currently auditing early DPP pilots with a mixed-method study that seeks to (i) characterize the interaction layer of deployed DPP pilots (ii) evaluate how different interaction patterns shape comprehension, behavior, and attitudes, and (iii) surface concrete examples that can guide in the design of fair interfaces for the DPP. This work deliberately considers what might be considered transparency and information disclosure through the lens of choice architecture and pattern-based design, and attempts to analyze the behavior that is afforded. One additional argument for this choice, is the affordances of the DPPs as interactive UIs where severel different actions can be requested by the user right on the same page as information is displayed (see fig. 3).

Our study follows a three-tiered structure, where we move from explorative to evaluatative before generating new design. First, we conduct user-studies and contextual interviews with customers where DPP pilots are employed. Think-aloud scanning tasks probe incentives to scan (e.g., care/repair vs. sustainability), first impressions of what users immediately seek once interacting with a DPP, and how concepts such as an sustainability are understood. In this first phase, interface affordances are analysed from a sociotechnical perspective [18].

Secondly, we run paired online (e.g., Prolific[3] and in vivo tests to balance control and ecological validity. Here we are interested in basic metrics for user experience [19] alongside perceived manipulation, trust/credibility (provenance, uncertainty/caveats).

Finally, guided by findings, we prototype small fair-pattern variations and conduct "white-hat"-sessions anticipate 'failure', where we redesign fair components into persuasive or misleading UIs, or reframed by commercially oriented intermediaries as rigged rankings and deceptive patterns.

With this study, we aim to illuminate current DPP pilot practices and their value for end-users. By demonstrating the tangible benefits of high-quality user interfaces, we hope to encourage different interests to view the DPP not merely as a regulatory obligation but as an opportunity to create real value for customers. Additionally, this is also an example of how HCI and UIs design can be part of shaping the practical implementation of new legislation, with the ultimate goal of supporting more sustainable and ethical consumption. **With this paper, I extend an open invitation to collaborate on examining the current and ideating a future where DPPs can become a leading example of fair patterns.**

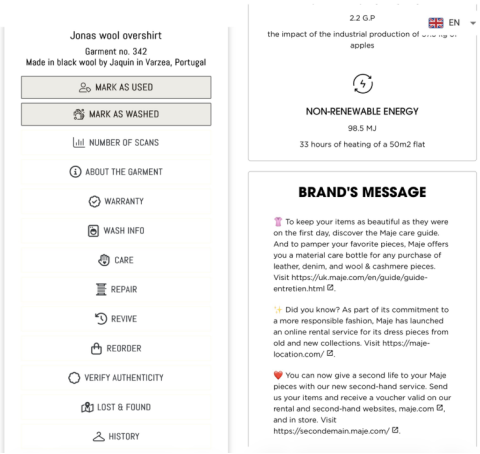

Figure 3: Two different examples of DPPs. Left: the user is offered an long list of actions clearly featured as buttons. Left: included in the "Brand's Message" are three request for the user to interact.

[2]The theoretical arguments and speculations presented in this paper are my own. Section 4 describes ongoing empirical work conducted in collaboration with colleagues, hence the shift to 'we'.

[3]www.prolific.com

Declaration on Generative AI

The author(s) have not employed any Generative AI tools.

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