PEER REVIEWED

Smart Packaging for Smart Devices: Designing a Good User Experience

As the use of health apps among the general population continues to grow[1], medical device developers are beginning to look to companion apps to tackle the challenge of poor adherence, improve patient experience and ultimately improve healthcare outcomes. These apps are typically paired with a physical device, allowing users to track their symptoms and dose history, access key information and generally provide support as they manage their condition.

While the benefits of companion apps may seem clear, convincing users to engage with them can however be challenging. As medical devices become smarter and incorporate new connected technology, users are required to not only learn how to use the physical device, but also to download and pair it and sign up to sharing their data. The fact that connectivity may be an add-on to an existing platform device, which can function both with and without it, only increases the challenge of engaging users with the full digital experience.

Apps themselves can be an effective tool in onboarding a patient to a new therapy, however you first need to help your user to download and engage with them. Fortunately, designers have options to utilise different elements of the product ecosystem to prompt and encourage desired user behaviours. One of the first of these elements that a patient will interact with is packaging.

Packaging provides us with a golden opportunity to introduce users to a new device. As the first physical touchpoint they will have with a product, it can be used to convey key information and prompts to help users set up and use their device safely and effectively. As we begin to introduce new connected technology to devices, packaging also offers an opportunity to guide users towards companion apps and can be viewed as the first step in digitally onboarding them.

For packaging to be used most effectively, we must consider it as part of a wider product ecosystem, including printed information, physical product design and digital assets. Each of these elements can be used as an effective tool for encouraging desired behaviours in users, especially when used in combination. To begin planning how to use these system elements effectively, a useful first step is mapping the user journey.

Mapping the journey – defining the challenges that need solving

A journey map is arguably the most valuable exercise to undertake at the start of any design program, allowing us to map out how a user will typically interact with our product. The aim is to gain an understanding of the entire user journey through the eyes of the user, considering the challenges they might face, as well as their behaviours and motivations. The exercise also helps to identify any knowledge gaps which may need further research to fill.

Such a process doesn't have to be complicated. Essentially, the aim is simply to understand at an appropriate level of detail what goes on when a user interacts with the product, their common or existing behaviours, typically from the moment they are supplied with the system kit to the moment they dispose of it. By analysing each step in the process, we can identify 'pain points' – moments in time where an interaction might cause confusion, discomfort or anxiety – where a user might struggle physically or cognitively to complete a task. These pain points can then be aggregated into what are referred to as 'design challenges', which help us to see more clearly where each element of our system may enable us to address a challenge, encourage a correct behaviour and provide an optimal user experience. It can also be used to identify the best opportunities to signpost users towards our digital solution.

Smart system design

Designing an effective onboarding experience requires a combination of good UX design practice and behavioural design principles. There are a number of behaviour change models that can be applied to inform design decisions. The Fogg behavioural model is a good starting point, which is formed from the basis that three things must happen simultaneously for a behaviour to occur: Motivation, Ability and Prompt (B=MAP).[2] The user must be sufficiently motivated to adopt a desired behaviour, have the ability to do so and receive a prompt.

The use of behavioural design in digital applications is already well established, and there are learnings we can take from digital UX/UI design that can be mapped onto the physical elements of our system. For example, 'progressive disclosure' refers to the approach of gradually revealing important information to digital users, to avoid overwhelming them or missing key

Figure 1

Figure 2

concepts. 'Tunnelling' and 'chunking' use a predetermined sequence of steps to encourage a desired outcome. The focus here is getting the user to complete one task or goal rather than many, alongside breaking down information into small, memorable parts to avoid overloading them.

Similar design approaches can also be adopted in the design of packaging and printed information. If we look at Figure 1 for example, the packaging for this auto injector has been designed in a way to simplify the unboxing experience, with key information provided on each flap that the user must physically open to see (progressive disclosure). The aim here is to not overwhelm the user with information all at once, instead ensuring they work through each step in the correct order.

Similarly, when designing printed patient information such as Instructions For Use (IFU) we can break up content by chunking user steps. For example, when using a single sheet of print, folds in the paper can be used as natural breaks to guide the user through different stages and separate each step (see Figure 1).

Print vs digital

As people react differently to different media, it's important to offer users a combination of ways to access key information, across both print and digital. There are of course pros and cons to each of these media, however the key for both is to make the experience as frictionless and simple for the user as possible.

As mentioned previously, packaging and print are often the first point of contact your user will have with your device, offering a useful opportunity to begin onboarding them and guide them through set up. While smartphone apps are well suited to help users set up their devices, your user is however at risk of losing attention owing to other notifications and distractions. The benefit of physical, printed materials is that they are less likely to be competing with these same distractions. While many of today's users may have a preference for digital media, studies have shown that people may remember more key points when reading on printed material rather than digital.[3]

IFUs

Printed Instructions For Use (IFU) are a regulatory requirement for medical devices and need to adhere to strict rules on the critical information they convey about both the device and the drug. Typically made up of a single sheet or booklet, printed IFUs have a larger visible viewing area than a single app screen, meaning we are able to show users much more content in a single view, but the information is static. This allows the patient to see the full set-up process they will need to undertake. Unlike an onboarding process through a smartphone app, the patient can also easily refer back to previous steps as needed, giving them more control over the information they see.

While these are all potential benefits, there is however also a risk of overwhelming the patient with too much information, which

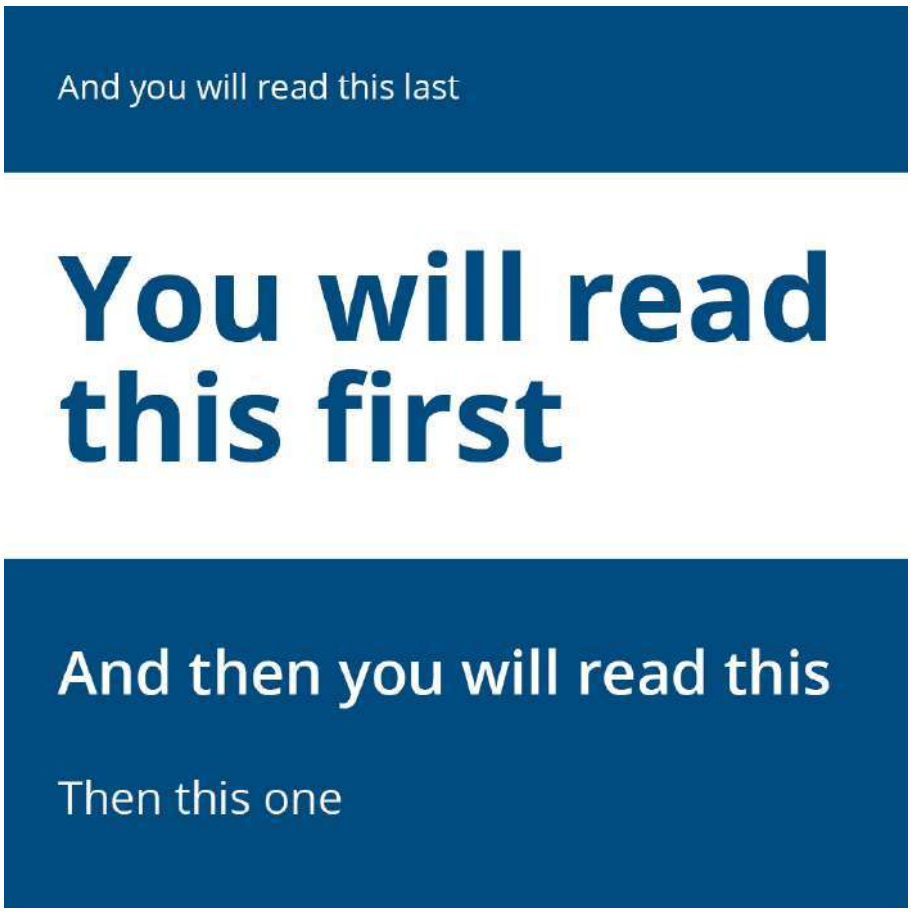


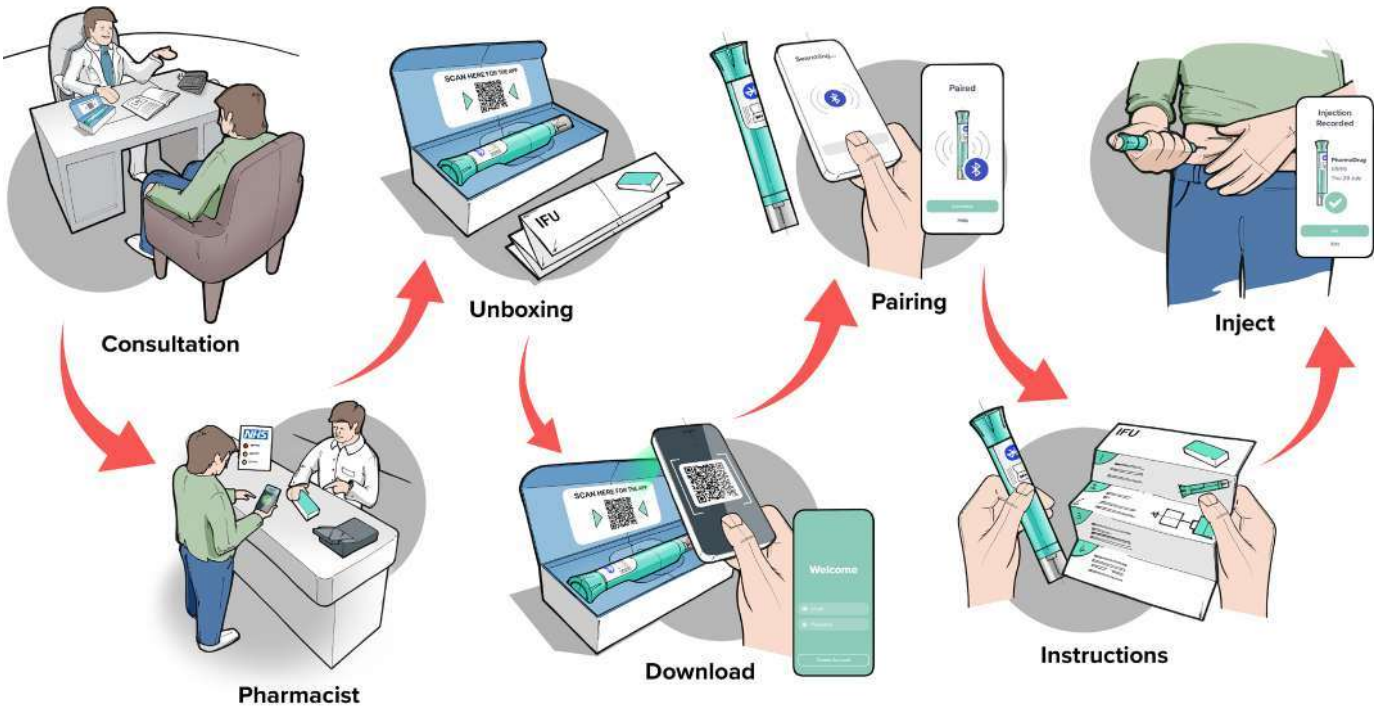
Figure 3

Figure 4

could result in them missing important device set-up steps or content. IFUs need to contain a lot of information, including potential side effects and contraindications. This essential information, by nature, often has to focus on telling people what not to do, rather than just focusing on how to set up their device. As designers, we need to balance these requirements whilst still ensuring we create instructions that are easy to follow.

We need to choose the best format for an IFU, whether that's a booklet, concertina, gate fold etc, considering the information that needs to be communicated and focusing on the placement within the pack, the user and environment of use. We must establish a clear hierarchy of information on a page to aid navigation and reduce visual clutter, by clustering information and making careful use of typography, colour and white space.

Type form is an essential way of guiding your user across the page. For IFUs and printed materials, draft guidance from the FDA recommends a minimum font size of 10 points and suggest a sans-serif font such as Arial or Verdana,[4] however limiting yourself to these fonts can be quite restrictive. For example, fonts that use open counters (the open space in letters such as an 'o'), an established lowercase height and minimal stroke contrast can all help the



user distinguish between different letter forms more easily. The arrangement of text across the page, as shown in Figure 3, can also make the text much more readable and accessible.

The brain handles images better than text, so a combination of images and text to tell a story is also very powerful when designing an IFU. Careful consideration must be given to the placement of images in relation to text and to the style of the imagery. Creating illustrations from the users' viewpoint can help to aid orientation whilst the considered use of colour and line weight draws attention to relevant features.

Smart packaging for digital onboarding

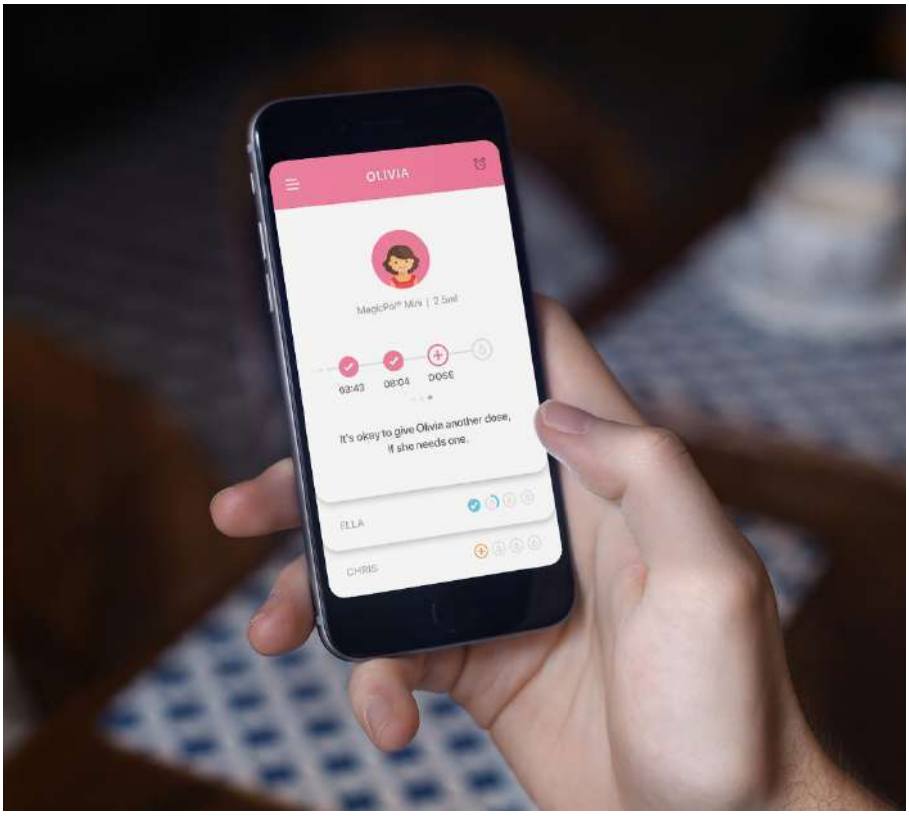
While packaging can be used as an interactive tool to guide users through their device set up, digital solutions offer further opportunities to assist with onboarding and competency. In this case, the core focus of the packaging may need to switch to signposting users to your companion app as quickly as possible.

The introduction of new technologies such as App Clips and fast pairing has made this process a lot easier. App Clips offer a basic version of an app that can be accessed without the need to search for and download the full product. The idea behind this is to convince users of the benefits of the app before they commit to it. A key part of the App Clip experience is how you discover it. Having a QR code, or possibly even an NFC tag on the packaging that a phone can be tapped against, can help to remove the barrier of forcing the user to search for the app on the app store.

If we look at Figure 4, a self-testing kit, a QR code has been used to signpost the user to a companion app, which the packaging clearly states will be needed to complete the test. Here the main aim of the packaging is to guide the user as quickly as possible to the companion app, which will instead provide instructions on how to use the product. In this instance, the packaging makes it clear that the only way to access the instructions for how to use the test is via the app.

Smart design for the future

While society appears to be on the fast track towards a more connected future, it is safe to say there will still be a crucial role for packaging and print to play in the world of smart devices. Through careful consideration of our product ecosystem, we can optimise user experience across both physical and digital elements. Using behavioural design theories and applying UX design principles, we can help lower the barrier to adoption of new technologies, whilst ultimately enabling new tools to support patient adherence.



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Paul Greenhalgh

Paul Greenhalgh has 20 years' experience in the development of medical devices. Since joining Team Consulting in 2001 he has worked with some of the largest pharma companies and most innovative MedTech start-ups, developing ground-breaking solutions to improve the way healthcare is delivered. Paul is driven to design products that provide the level of UX we've come to expect, all the while working within the tight constraints of a highly regulated industry. He has a degree in Product Design from Central St Martins, London, UK.

Ben Cox

As Head of Digital Design, Ben works with a cross-functional group of designers, researchers and engineers to craft engaging and intuitive interfaces, and optimise the user experience of medical devices. With a background in human factors and user-centred design, Ben focuses on UX/UI from product vision to implementation. Previously, Ben worked in several design consultancies, as a clinical scientist and design engineer in the NHS, and has conducted extensive research for DePuy Johnson & Johnson. He has a BEng degree from Cardiff University and an MSc and PhD in Biomedical Engineering from the University of Leeds.