

THE FUTURE OF PRINTED BOOKS

2D and 3D Codes as Enhancements to Traditional Publications

Do you love printed papers and books? The way they feel in your hands, the possibility of underlining the most important sentences, or marking a page so that you can find it again? If so, you probably belong to the group of readers who will never be ready to give up this haptic experience, despite the increasing prevalence of digital books. But what about combining printed books with the advantages that the digital world has to offer? Such as watching a video that relates to the novel you are holding, or completing an online test about what you have just learnt from your textbook? Read how codes give you the freedom to choose when and where you want to switch to the digital world.

by Oliver Bendel

Electronic books are becoming increasingly widespread. An initial spark in the field of fiction came in the form of reading devices from Amazon and Sony, but even before that, applications had become available for cell phones and smartphones. In the academic field, electronic texts have been commonplace since the 1990s. Nevertheless, for decades to come there will be people who prefer printed publications. Both, digital and printed books have their advantages, and hybrid forms of publication allow us to combine the advantages and eliminate the drawbacks, resulting in a serious alternative with unique characteristics.

Machine-readable codes (see Tab. 1 for an overview) are one possible connection between the “reality” of

the printed book and the “virtuality” of data and files of all types. 1D codes, such as classic barcodes, have long been part of everyday life and are used mainly to identify and record objects, such as in factory production or in supermarkets. In Japan, 2D codes are widespread in the form of QR codes. Every day, end users there scan millions of these eye-catching two-dimensional codes with their cell phones. They are displayed, for example, in windows to allow consumers to find out about offers after the shops have closed. They also appear on posters and leaflets and are used to divert those who view them to websites, since the codes can contain not only text, phone numbers and text messages, but also web addresses or URLs.

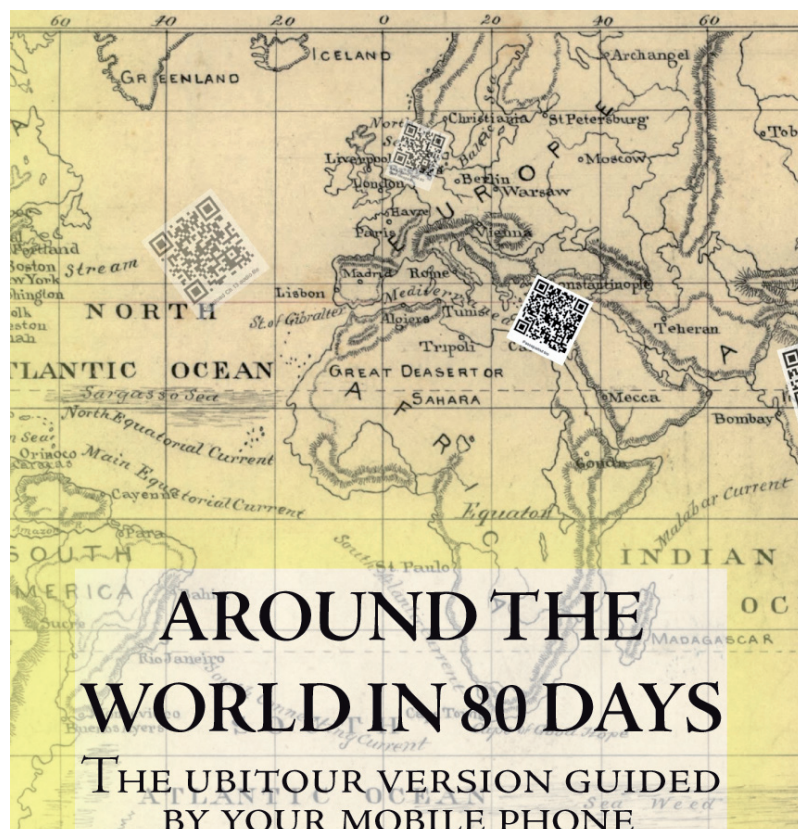
2D codes do not yet have anywhere near the same significance in Europe as they do in Japan, but they are becoming increasingly common wherever we want to summarize information in small spaces or avoid the need to type in complicated data. The DataMatrix code, which is used for tax returns, tickets, and letters, is familiar in the German-speaking world, and QR codes also enjoy a certain amount of popularity, revealing providers' and users' desire to experiment with new ideas. Perhaps 2D codes and, in particular, 3D codes will also have the power to transform the publishing sector in the future.

Hybrid Uses

Successful uses

Hybrid forms of publication have so far been used mainly by newspapers and magazines. There are hardly any books in this category (with the exception of those which include CDs or DVDs), although there is an abundance of ideas for this area. Hybrid forms of publication are, for instance, those in which printed pages are linked to digital information, and codes can be used to save data, from 1D- to 2D- and 3D codes. Two-dimensional QR codes would be well-suited to this purpose at the moment, while 3D codes with color as the third dimension could be used in the future. Below are three examples of successful uses:

First, at the turn of the millenium, a book called "iFlyer BirdSong Scanning Wand" with bright illustrations of North American birds was published in the USA and became very popular. A barcode appears next to each animal and when it is scanned



with the supplied reader, which also doubles as an output device with a loudspeaker, the respective bird-song is played. In addition to over 200 bird calls, ten different types of frogs can be heard.

Secondly, a special edition of the famous book "Around the World in Eighty Days" by Jules Verne was published in 2010 by the American company Ideagora under the label Ubimark Books (see Fig. 1). The person behind this project is an associate professor of Purdue University (Indiana). QR codes appear on every page and direct the user to websites containing additional information, and as some bloggers have observed, these QR codes function as "e-footnotes". The book is advertised using the strapline "The ubitour version guided by your cell phone", whereby "ubitour" means a "ubiquitous tour", according to the professor.

Fig. 4:
Cover of "Around the World in 80 Days" with QR codes

1D codes

The history of codes starts in the 1940s with the 1D code, i.e. with a barcode. Today, Europe's most widely known barcode is the EAN code. To display this machine-readable 1D code, four different widths of lines, or bars, and gaps are used. Barcodes can be found on most products, e.g. on books (see Figure on the left). The barcodes identify the manufacturer or distributor and the product, and can be combined with other data records. They facilitate processes such as entering the data at the checkout of a supermarket.

2D codes

2D codes are a further development of the 1D code from the 1980s and 1990s. A second dimension (to a certain extent the Y axis) is added which permits data capacities up to many times the storage size of a 1D code. 2D codes are mostly made up of squares and boxes; although the characteristic lines and bars are missing, 2D codes are sometimes also referred to as "barcodes". They can be read using markings from every position, all you need is a device with a camera and software. 2D Codes can be used to encrypt data and information on- or offline, such as web addresses, telephone numbers, and texts. Among the most common 2D code types in Europe are the DataMatrix and the QR ("QR" stands for "quick response") codes. DataMatrix codes are used, for example, for letters and tickets. QR codes (see Figure on the left) are readable by conventional cell phones and smartphones and are found on business cards, brochures, placards, and in display windows.

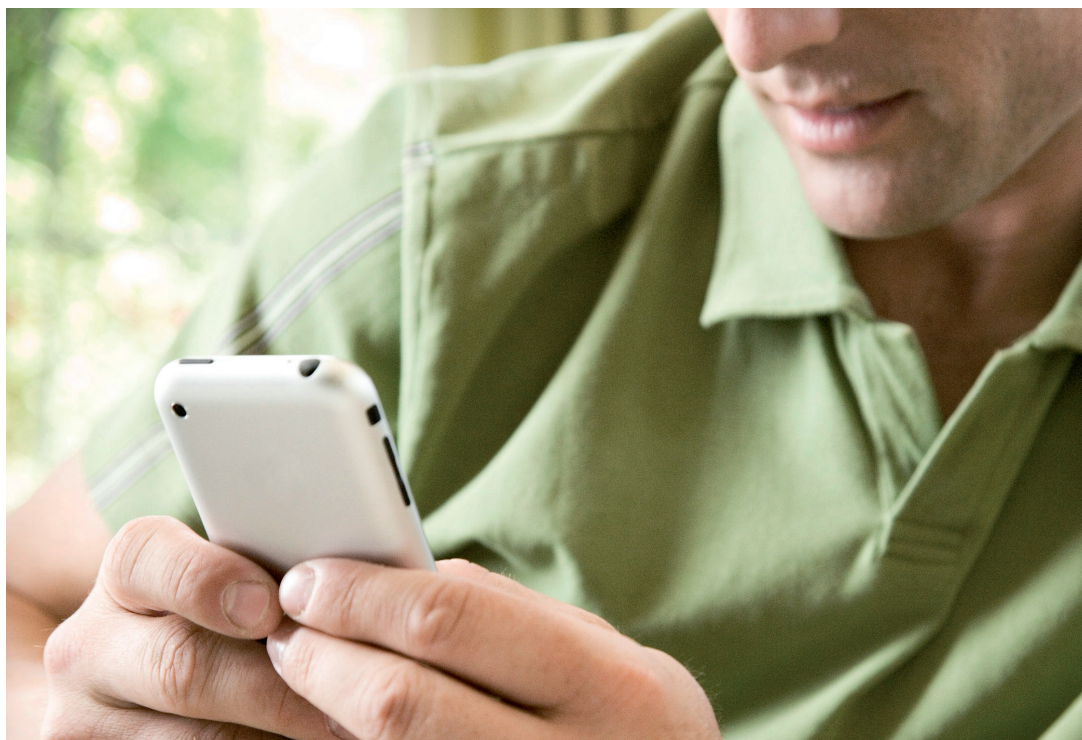
3D codes

2D codes can be transformed into 3D codes by adding a further dimension, thus increasing the storage capacity enormously. Experiments in this field have been carried out for years, and the first practical examples are being implemented, for example, by Microsoft. For the third dimension, for example, color specifications can be used (see Figure on the left). By using 8 to 24 colors, for example, a storage capacity of over 1 MB can be achieved. Although even gigabyte territory would be possible – which would make offline applications conceivable – there is currently a lack of convincing and widespread realizations at a technical level.

4D codes

4D codes have a fourth dimension that can be generated, for example, by an animation or a relief pattern, which results in a very large storage potential. They are currently at an experimental or prototypical stage (the Bauhaus-Universität Weimar submitted a proposal in 2007). While worthwhile applications are quite conceivable in the field of electronics, 4D codes are generally not an option for printed books. At the most, a fourth dimension for printed matter could be theoretically achieved with a "flip book" or by embossing it on paper and envelopes.

Table 1: The Evolution of Codes



Thirdly, the author's own publication from 2010, "handyhaiku", also explores new ground. Haiku are short Japanese poems. In German they contain up to 17 syllables, and the usual pattern is 5 – 7 – 5, whereby each "package of syllables" belongs to a single line or section. The haiku in "handyhaiku" are not only printed in text form but also as QR codes, enabling users to scan their favorite poems onto their cell phone and to send them to friends and family. The haiku tell of a time dominated

by technology and the media, capturing the mobile world, featuring made-up creatures and machine people, and reflecting characters from fiction and mobile fiction, so their form and content are closely related.

If 3D technology becomes widely available, reference books, school books, and textbooks could be enhanced using additional information. Users would benefit from the advantages of both the printed and the digital medium, and readers could, for example, study with a printed book on the beach or by the poolside, highlighting sections and making notes. If they wanted to go into more detail or test themselves on what they have learned, they could call up a video using a 3D code or complete a test on their cell phone. Alternatively, a producer might encode the solution to a task and make it accessible to recipients via their cell phone. For smaller amounts of data, this would even be possible using a 2D code.

Abstract

2D and 3D codes open up new opportunities in publishing. They can be used as digital expansions of traditional, printed books and scanned by using a cell phone or smartphone, enabling you to view pictures, watch videos or complete tests. The data is stored either on web-based or mobile platforms or directly in the code, and the first examples of such enhanced books are already available on the market. This article introduces possibilities and examples of the application of codes and develops scenarios for hybrid forms of publication.

Distinct differences

At this point, it is important to highlight once again the differences between the three examples given above. The barcodes in the bird book serve only to establish a connection between an illustration and an audio file, with the data for the bird calls being saved in the input and output device. With the poetry collection, each haiku is saved in its entirety in the QR code and the cell phone is simply the display device and does not “know” the poem until it is scanned in. Finally, in reference books, school books and textbooks, short solutions or more extensive content, such as videos and tests, would be saved in 2D- or 3D codes. Here too, the cell phone or smartphone does not “know” what it displays or for what purpose before the scanning takes place. Indeed, content may not only be displayed but can also, in certain cases, be manipulated and edited by the users. An online connection is only required for the second example, the Jules Verne book, and it could have a similar effect to that achieved in the bird book, with the code being used to establish a connection between the real object and a virtual medium, such as the Web or a mobile shop. It is open to debate whether online or offline processes are the way forward. Of course, we are increasingly going online with mobile devices, so it would stand to reason that we should use the code simply as a means of linking to content saved on an online platform, where it can be changed and replaced as necessary. At the same time, however, it is clear that the mobile domain is increasingly subject to malware, spyware, and spam, so for these and other reasons, users will also want

to use cell phones offline. It is also conceivable that there could be a market for cheap, simple minicomputers, or “intelligent sheets”, optimized for reading this kind of information.

Key Learnings for...

- ▷ the market: Even with 2D codes, printed books can be enhanced in an impressive manner these days. With 3D codes, the paper would be transformed into a rather different kind of storage medium and could contain supplementary texts, high-resolution images, videos, and audio files. Convincing technical concepts for 3D codes with a high storage capacity already exist; the generators and reading devices just have to be programmed.
- ▷ certain industries: The printing industry and those publishers and bookstores who focus on traditional books are under considerable pressure as authorship, production, form, content, formats, marketing, distribution, and reception change. With the help of the 2D- and 3D codes, they could continue to operate in their core businesses and still adapt to changed demands and expectations with hybrid forms of publication being a viable alternative to purely electronic products.
- ▷ readers: Users will still be able to buy and read, or view, printed books and yet have the option to be guided to virtual information or have digital contents conveyed to them. They can benefit from scenarios that give them a total freedom of choice as, for example, they only call up a more detailed video if they need it or get solutions to tasks and tips on how to proceed to the next step.

Mobile tagging

Mobile tagging is the connection between real objects and virtual information, and hybrid forms of publication can be used in the context of commercial tagging, public tagging, or private tagging. The aforementioned reference books and textbooks would be good examples of commercial tagging, a city guide provided by public authorities could be a form of public tagging, and a tagged diary or photo album would be an example of private tagging.

Tickets, vouchers and adverts could also be integrated in books, and it would be possible to tell an electronic system which chapters have already been read, which would undoubtedly be a relevant feature for learning diaries.

Outlook

Hybrid forms of publication of the kind described here are at present already significant for publishers and readers, or users, but other interested parties could also become involved, for example, to supplement books with specific information. Hybrids accommodate both, those devoted to traditional books and the aficionados of digital media, combining the benefits, eliminating the disadvantages, and displaying unique characteristics.

The cost reduction at different levels has been touched on only briefly here. Codes are cheap to produce and help to integrate virtual elements, which then no longer have to be printed, and end users can access these with devices they already possess. It is astounding that in such a crisis-stricken and changing industry there has so far been so little willingness to think in new ways that do not require major investment but simply new approaches.

It is important to emphasize once again that the market for 2D code readers and generators is large and that both, producers and users can choose from a wide range of free tools. If a similar boom is seen in the market for 3D code readers and generators, the industry should be ready, and of course, it could also trigger and promote developments for itself. When it comes to transforming the book trade, the industry should be the driver, not the driven. ▲

Service

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Oliver Bendel was born in 1968 in Ulm. After completing his degree in philosophy and German philology (M.A.) as well as in information

science (diploma in information science) at the University of Constance, and after gaining his first professional experience, he did his doctorate in information systems at the University of St. Gallen (Dr. oec.). Bendel has been working in Germany and Switzerland as a project manager for new media and as a supervisor of the engineering and science departments at several universities. Today, he lives in Winterthur, working as a freelance writer (traditional and electronic literature) and as a professor at the School of Business, University of Applied Sciences Northwestern Switzerland FHNW in Basel.

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