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*Page layout is dominant in many genres of physical documents, but it is frequently overlooked when texts are digitised. Its presence is largely determined by available technologies and skills: If no provision is made for creating, preserving, or describing layout, then it tends not to be created, preserved or described. However, I argue, the significance and utility of layout for readers is such that it will survive or re-emerge. I review how layout has been treated in the literature of graphic design and linguistics, and consider its role as a memory tool. I distinguish between fixed, flowed, fugitive and fragmented pages, determined not only by authorial intent but also by technical constraints. Finally, I describe graphic literacy as a component of functional literacy and suggest that corresponding graphic literacies are needed not only by readers, but by creators of documents and by the information management technologies that produce, deliver, and store them.*

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This paper is about page layout – the arrangement of different text elements (for example, chunks of prose, illustrations, and headlines) within a physical frame such as a book page or a screen. It is an aspect of text that has not been as widely studied as some others and that is easy to overlook. It is largely (but not entirely) absent from literature, and it is therefore correspondingly absent from literary studies of text, and absent from theories of text that originate in literary studies. Instead, it is associated with nonliterary genres such as children's books, user manuals, catalogues, and newspapers, which have been less intensely studied. Because layout is a nonlinear, holistic quality of text, it is hard to define and to quantify. And it tends to get forgotten when new technologies for creating, storing, and retrieving text are developed.

In this paper I want to position layout as a less peripheral feature of text than it has often been considered – as an important infrastructure for reading and writing in an age when few make time to engage with long linear texts. I demonstrate its function and the key role that technology has played in enabling or suppressing layout in different eras. I then discuss its role in enabling effective reading, and I review some of the theoretical approaches that have been proposed within different disciplines. Then, looking forward, I discuss future types of digital text, arguing for the

continuing requirement for graphic layout even in digital text, and for its incorporation in our definition of communication competence and literacy.

Traditionally, readers have almost always encountered text in the context of a document: an object with borders, with a declared aim, with a defined authorship, and within a recognized genre – with all the conventions, rules, authority, and audience expectations that are implied by that. Text (language string) has usually been situated in a text (document).

In the new digital culture, though, text is frequently encountered as search results – fragments detached from their document context, alongside fragments of the vast unmediated mass conversation that is social media. And similarly when scholars discuss language and information as an abstract concept, it is often in the form of strings of text that we can easily store (for example, in language corpora), search, and analyze, rather than contextualized in physical documents.

There is general agreement that through technological change we are experiencing a very major shift in the way we communicate, and what we communicate – perhaps equal to the development of printing. There are well known arguments that the way in which we frame our thoughts for the communication and preservation of knowledge has a profound effect on how we think.<sup>1</sup> In our own era we face the loss of authority, as knowledge becomes crowd-sourced through social networks, and with the loss of coherence as we experience information in fragments via a search engine. Both of these are reasons why layout might be going out of style – representing, as it does, a carefully considered, editorially mediated, and designer-crafted presentation of a complete message.

Paradigm shifts (and some would claim that is what is represented by digital communications) are traditionally carried out to the sound of exaggerated debate between old and new, which can be difficult for those who appreciate aspects of both positions. In Plato's *Phaedrus*, Socrates famously remarks to Phaedrus that writing would 'create forgetfulness.' He was right – we no longer memorize very much by rote, but we use writing as a memory tool instead. Like any physical tool it extends our reach, gives us focused functionality, and multiplies our strength through leverage.

Experience shows that new communication technologies rarely render old ones completely extinct. Instead, they more typically occupy a new niche that was not previously possible, with the old technologies often surviving but in a less dominant position than before. Theatre, cinema, TV,

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1 Among others, by thinkers such as Ong (1982) on the move from orality to literacy, Eisenstein (1979) on the move from manuscript to print, and McLuhan (1962) on the move from print to television. Baron (2008) has reported how the online world is changing our use and expectations of language.

DVD, and YouTube happily coexist. While the devices that deliver them might converge, it appears that there will still be distinct audiences and occasions for live performances as well as stored ones, shared experiences as well as private ones. People still memorize the alphabet, mathematical tables, songs, poems, and speeches. And even parchment scrolls still exist for ceremonial functions such as academic degree ceremonies, in which a document plays an important performative role.

That having been said, there is an inevitable moment during a communications revolution when a traditional channel or technique seems to be doomed to extinction, and this is a good time to assess its usefulness. Page layout is a little-discussed aspect of text, but it connects closely to a range of fundamental issues concerning the nature of text, documents, writing and reading. Do we still need it, what are the apparent threats to it, and are there any reasons to suppose it might survive or re-emerge?

A book reviewer of this area remarked that

one problem besetting the theorization of multimodal discourse is that most senior scholars entering the field have been monomodally educated: they are linguists, or musicologists, or art historians. Inevitably, they are thereby biased by their original field of study, and limited by their restricted knowledge of other disciplines.  
(Forceville 2007, 1236)

To declare my own focus and bias: my field of study (and practice) is typography and graphic communication, a relatively immature field largely focused on professional practice rather than theory.





Figure 2. Composite screen image from The Guardian website, accessed January 26, 2011. It may not be clear from this reduced-size reproduction, but the links in the middle and right columns do not relate to the story on the left.

editorial comment (signalled by the author being identified not only by name but with a photo). The evidence about the human impact of a stagnant economy is supplied by the case study in the centre (on a beige background in the original), and a supporting voice is supplied on the right by a column headed 'Analysis'. All this is visually signalled by distinct graphic zones, and hierarchies of differently sized headings which supply the discourse cohesion that in a purely linear text would be signalled in words.

One way to judge the function of layout in a spread like this would be to remove it – to turn it into a single linear text, with no differentiation between sections (a commutation test, in effect<sup>3</sup>). That is exactly what the newspaper does on its own website (Figure 2).

The same story in its web version is stripped of its layout. The connected stories (the case study and the analysis column) have disappeared from view – they do exist elsewhere on the website, but there are no direct links to them. And although the paper version includes just one unrelated element (the advertisement), the web page has numerous links to unrelated stories and sections that seek to distract or divert the reader.

The reader of the paper version can slip easily between related stories because cohesion within the set is provided graphically: their physical location, the typographic hierarchy, and visual genre distinctions all provide cohesion cues that in the Web version are absent or are entirely lexical. Importantly, the related stories are physically parked on the same page as the story being read at any one time. This means they are hard to lose track of, and remembering their presence adds little to the reader's cognitive load.

### Layout and technical affordance

Although the Internet is usually assumed to be the more interactive experience, the reader of the online version actually has the more linear experience at the page level, although readers can still look back and ahead within the story – and, of course, they have the huge benefit of being

3 A commutation test, in semiotics, tests the relative strength of a potential signifier by changing it in some way – for example, by removing or substituting it in order to assess its contribution to meaning. See Chandler (2007) for a fuller account.

able to search electronically, and connect directly to intertextual references or citations.

E-readers are very well accepted by readers of fiction and are overtaking paper books in sales. But they are less well accepted by people who need to study. Users of e-readers or smartphones have a restricted view, and evidence is appearing that suggests that currently available devices are struggling for acceptance by readers whose tasks are not simple and linear (see review by Thayer et al. 2011).

Attempts to introduce e-readers for academic study consistently disappoint:

Students often mark up texts, seek out and assess references, multitask while reading, and generally do more than just read the words on the page or screen. Similarly, academic work involves a variety of navigation techniques, such as crossreferencing information within a text and across multiple texts. Studies of e-readers in academic environments indicate they are imperfect devices for these activities. (Thayer et al. 2011, 2918)

It is not entirely surprising that e-documents of this kind seem to have missed the mark for readers – it has happened before. When new technologies are developed for text, when we discuss it and analyze it, when we design systems to store and retrieve it, there is a consistent default assumption that text is little more than a linear string of words and sentences.

Viewing medieval manuscript books one is struck by their typically close integration of the visual and the verbal. I could cite any number of examples and collections, but the Schoenberg Collection (as represented in Black 2006) is particularly striking as it consists largely of information documents, rather than religious or philosophical texts. But when Gutenberg developed moveable type, a side effect of his communication revolution was that the typically high integration of image and text found in manuscript books was largely lost, only reappearing on a large scale with the invention of chromolithography and photo-engraving, and with the growth of mass literacy, newspapers and magazines. Printing had such an impact on the spread of knowledge, science, and education that the relative poverty of its graphic form could be overlooked.

Something similar is happening, possibly temporarily, with the development of electronic publishing. When hypertext emerged in the 1980s it was heralded as a release from the pure linearity of text, as if we were still in the days of cuneiform, with no headings, contents lists, indexes or diagrams – for example:

Unlike the static form of the book, a hypertext can be composed, and read, non-sequentially. (Landow & Delany 1991, 3)

Text is typically presented in linear form, in which there is a single way to progress through the text, starting at the beginning and reading to the end. (Foltz 1996, 109)

**Gardening manuals from c1100, 1929, 1967, 2010.**

Before printing, the integration of text and graphics was common.

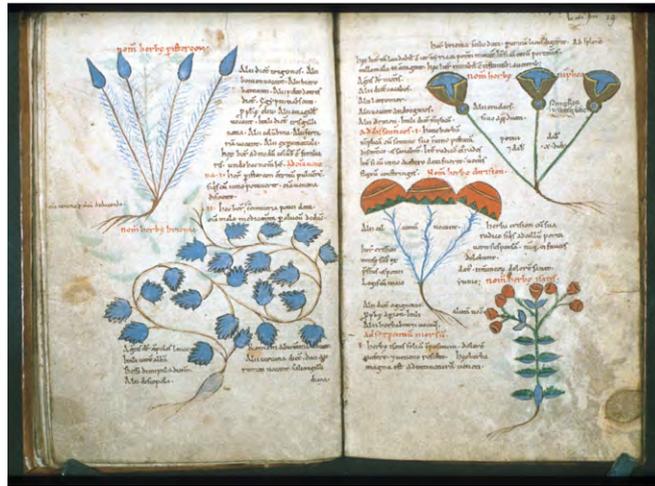


Figure 3. An 11th-century herbal: Ps. Apuleius, Herbal England, St. Augustine's Abbey, Canterbury. 11th century, circa 1070–1100. Ashmole 1431, fol. 018v-019r. Copyright Bodleian Library, University of Oxford. Reproduced with permission.

Letterpress printing made this difficult and expensive.

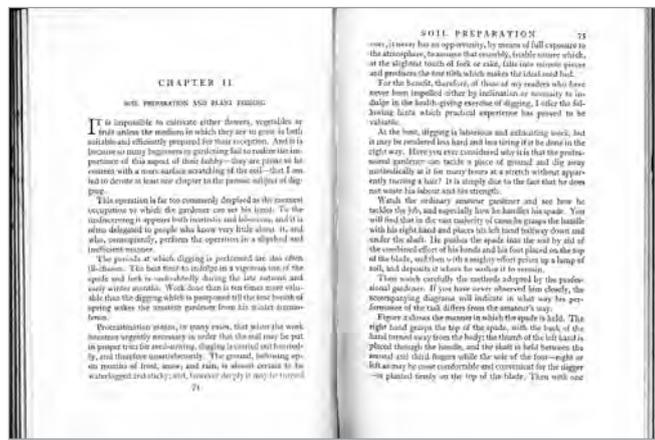


Figure 4. Spread from *Everyday in My Garden* (F. Hadfield Farthing, 1929. London: Knopf).

Early e-books once again suppressed illustration.

Illustrated, integrated books, designed as pages or double-page spreads, became common again in the 1960s, as technical developments made it easier to lay out and print colour pages.

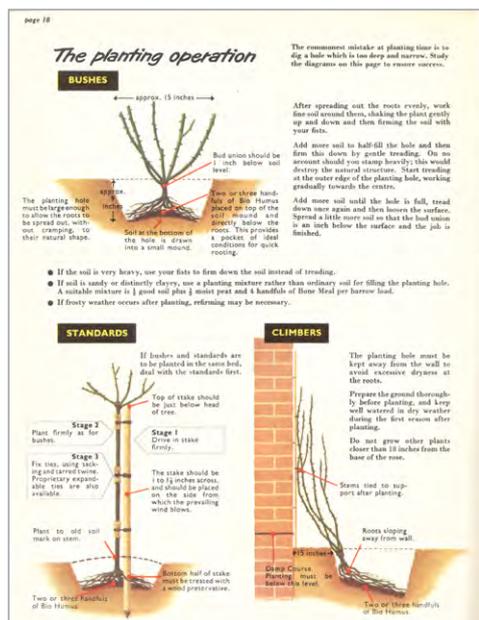


Figure 5. Page from *The Rose Expert* (D.G. Hessayon, 1965, London: Trans-World Publishers).

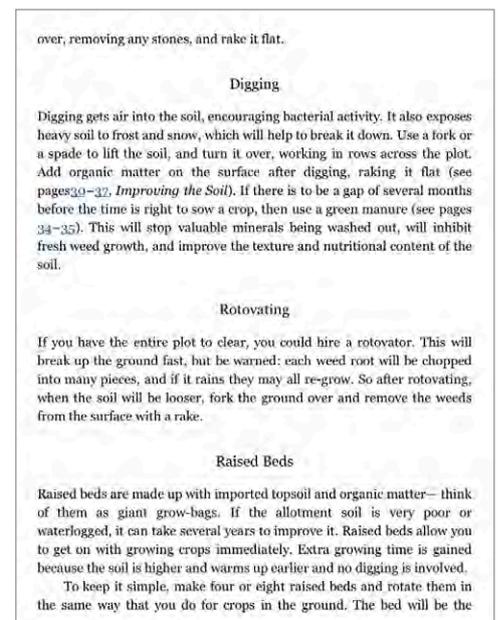


Figure 6. Screen from *Allotment gardening* (Berger, S. 2005. Totnes: Green Books. Kindle edition 2010). Note that page breaks have no regard to content, so widows (isolated words and lines at the top of pages) are common..

These quotes (which I could have selected from any number of papers on hypertext in the 1980s and 1990s) perfectly illustrate the linearity assumption – that text, like speech, is linear by default; that it is produced in a linear way, and that it can only be consumed in a linear way.

Figures 3–6 show books relating to the cultivation of plants from circa 1100, 1929, 1965, and 2010. They typify the age of manuscript, of letterpress, of offset lithography, and of the first generation of digital books. Page layout breaks out when freed from linear production technologies, but is suppressed when the next technical development reverts to the linear default.

In 2010 Adobe Systems Incorporated, maker of page layout software, was unapologetic about the lack of support for layout in its eBook format, in this note from its support page:

‘Why does my eBook look different than my InDesign document?’ The EPUB format does not define page structure, so all the content flows together in one continuous linear stream. This can present a problem for publications that have an elaborate design. For example, if your InDesign document contains a lot of sidebars and images that are surrounded by text, they are linearized in the eBook, so it will look quite different than the original layout. However, if your layout is quite simple, you probably won’t notice much of a difference between it and its eBook equivalent. (Adobe Systems, Inc. 2010, 2)

This rather retrograde assumption of a linear norm will probably be temporary, and some newer formats announced for online textbooks have paid rather more attention to the needs of readers and the demands of complex content.<sup>4</sup>

## Layout and readers

### Strategic reading

Why are some kinds of e-documents accepted by readers (novels) and others (textbooks) less well liked? When we read a novel we engage in a style of reading that is sometimes called ‘receptive,’ ‘linear,’ or ‘close’ reading. Unless we are reading it as a student or critic, we follow the narrative at a fairly even pace, controlled by the writer.

Studying, in contrast, is an example of what we might call a selective or strategic reading process (Paris & Myers 1981; Pugh 1975). Strategic readers use a document, or a set of documents, to achieve a goal. They engage in receptive reading for some of the time, but monitor their understanding, and their progress toward the goal, in a process known as metacognition (Brown 1980) or executive control (Britton & Glynn 1987). They then adjust their style of reading in response to this internal metacognitive feedback.

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<sup>4</sup> For example, the Inkling format ([www.inkling.com](http://www.inkling.com)) and the Apple iBooks textbook ([www.apple.com](http://www.apple.com)).

Strategic reading is enabled by what the typographer Beatrice Warde<sup>5</sup> called the ‘three great privileges of printing’ (to turn back, to look forward, and to stop and think), and is echoed in Daniel Pennac’s (2006) classic *The Rights of the Reader* (his ten rights include ‘the right not to read,’ and ‘the right to skip’).

Pugh (1975) identified five strategies: *receptive reading* is reading from beginning to end with little variation in pace – appropriate for the novel reader, and well suited to e-readers, but less appropriate to intensive study or problem solving; *responsive reading* means an active engagement with the arguments in the text, with frequent changes in pace, pauses, and rereading; *skimming* is a quick read to overview the structure or content of a text, either before or after a full responsive read; *searching* means looking in a general way for answers to a question; and *scanning* means searching for a specific word or phrase. Of these five strategies, electronic documents are particularly well suited to receptive reading, skimming, and scanning (using the search facility in a browser or e-reader).

Studying is not the only strategic reading activity. Information documents of all kinds need to be read strategically. No sensible person chooses from a catalogue, sets up a DVD player, selects a hotel from a travel guide, or looks up a word in a dictionary by starting on page 1 and reading through until the end.

Strategic reading is at the heart of document literacy. Along with prose literacy (which measures the fluency of receptive reading) and quantitative literacy (the basic arithmetic needed for everyday life), document literacy is a key aspect of a wider term, ‘functional literacy’ (OECD 1997). It refers to the ability to use documents to achieve purposes and solve problems. The tests used to measure it mostly use visually organized documents rather than continuous prose: for example, forms, timetables, instructions, and user guides (Evetts and Gauthier [2005] include many examples). In many schools and in adult literacy classes, readers are taught active reading strategies: the use of access structures such as contents lists and headings, the use of multiple sources, and ways to approach different document genres. In fact, the concept of literacy has become increasingly broad, and the International Reading Association now includes visual literacy in its definition (Edwards 2010).

Of course, the deployment of these skills depends on documents that afford, allow, and encourage these strategies: providing readers with what they need to read strategically. Textbook designers know that students need information to be broken into chunks, and well supplied with headings,

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5 In her foreword to Steinberg (1974).

illustrations, notes, and meta-level study aids.<sup>6</sup> Together, these comprise what Anderson and Armbruster (1985) call a ‘considerate text’ – a term that might be more widely applied to any text that reflects the needs of readers, rather than just expressing the topic structures and arguments of the writer.

### Linearization in language

At its most basic level, language is obviously linear – in most languages, word order is critical within the sentence – and explaining the sequential, or syntagmatic, relationship between words has been a major preoccupation of linguistics. Together with the principle of the primacy of speech, this explains why until fairly recently linguistic scientists rarely acknowledged graphic aspects of text.

Above the sentence – at the level of paragraphs, sections, chapters, or stories – we become increasingly less dependent on syntax and more on the presence of explicit structural or cohesive cues. As a simple example, the expression ‘on the one hand’ in English tells us that one aspect of an argument is about to be presented, and then contrasted with another, which will be announced by ‘on the other hand.’ In effect, a diagram is being constructed verbally. ‘On the one hand’ is an example of a cataphoric (looking ahead) reference, which requires readers to create a mental representation that is referenced by something they later read. ‘On the other hand’ is an anaphoric (looking back) reference, requiring readers to consult a mental representation of the text they have already processed.

In other words, it requires them to answer the implied question ‘other than what?’ from their memory of the preceding text.<sup>7</sup> It is a small step for designers to see those kinds of structural cues as opportunities to turn that putative mental representation into a diagrammatic representation<sup>8</sup> – for example, through bulleted lists, diagrams, numbered steps, or marginal panels. These are instances of documents as memory tools, reducing the need for readers to construct and refer to mental representations of content structure.

### Layout for strategic reading: overcoming the linearity of language

Our writing system has also evolved in support of these rhetorical structures: documents in their modern form work as tools for overcoming the linearity of language. Although this is often cited as a unique advantage of digital channels, it is not new. The history of paper documents shows the

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6 Collectively we can describe these as ‘access structures’ (Waller 1979). Research on their educational effectiveness is reviewed by Britton and Black (1985).

7 De Beaugrande (1984) presents a typology of linearization in language, which includes what he terms ‘core-and adjunct’ (which includes contrast, and hierarchical relationships), pause, heaviness, listing, disambiguation, looks-back, and looks-ahead.

8 I developed this analogy further in Waller (1982).

development of an increasingly rich range of ways to overcome the linearity of language and to make written information accessible: word spacing, punctuation, the codex, headings, page numbers, typographic structures, indexes, and multimodal layouts evolved over centuries. They moved the act of reading from a slow oral process to the fast, silent, and strategic process that we have discussed, in which effective readers deploy a range of strategies to achieve their goals: searching, skimming, recapitulating, and note-taking, as well as linear close reading.

It is not completely clear when silent reading developed, but Saenger (1982) argues that it was the development of word spacing in the early middle ages (seventh and eighth centuries) that freed readers from the linearity of slow oral reading, and transformed the way we study, and by the late Middle Ages, this had developed into a sophisticated system for the visual organization of text.

The complex structure of the written page of a fourteenth century scholastic text presupposed a reader who read only with his eyes, going swiftly from objection to response, from table of contents to the text, from diagram to text, and from the text to the gloss and its corrections. (Saenger 1982, 393)

This is how designers intend us to read modern structured books, too, although there is only a limited published literature accounting for their layout principles.

## **Theorizing layout**

### Layout in the literature of graphic design

We can find several alternative approaches to layout in the graphic design literature. This is typically presented in the form of manifestos, textbooks, portfolio collections, and memoirs – not peer reviewed in the academic sense, although often intelligently curated by an editor or publisher.

And of course most designers speak through their work, rarely stopping to articulate what they are doing except to teach students or coach employees in a studio setting. Schriver (1996) provides a good account of the graphic design literature, linked to related traditions in technical writing and usability research.

First, designers use *perceptual principles* established by the Gestalt psychologists (Wertheimer 1938) to account for graphic relationships among elements of a page. For example, whatever their actual content, we tend to assume that things that are physically close on the page are related in some way (the proximity principle), and that things that look similar are members of the same category (the similarity principle). Although no longer current among psychologists, for designers these principles usefully

comprise what might loosely be called a visual syntax of the page, and they are widely used in design education.

There is also a strong tendency among design textbook writers to focus on *formal* or *aesthetic* qualities such as rhythm, contrast, tension or balance. The use of visual form to direct readers' attention was well articulated by designers from the Bauhaus and New Typography traditions, influenced by the Gestalt psychologists, as well as art movements such as de Stijl and Constructivism (see Kinross [1992] for a good history and analysis). In particular, the Czech designer Ladislav Sutnar, a pioneer of designing in double-page spreads, articulated and demonstrated coherent theories about what he called function, form, and flow (Heller 1994; Sutnar 1961; Sutnar & Lönberg-Holm 1944). However, it still remains for such ideas to be integrated into a broader functional account of layout as a component in discourse, and as an infrastructure for writing and reading. In the hands of many design textbook writers these formal graphic qualities are treated as the counterpart to poetic and expressive qualities in verbal language, so they relate more to reader engagement than comprehension.

Twyman (1979) demonstrated the wide range of graphic language that can coexist within a single taxonomy that distinguishes between the mode of symbolization (prose, numbers, pictures, schematics) and the mode of configuration (how elements are ordered and accessed in linear, semilinear, and nonlinear ways). This tradition of thought led in turn to the idea that typographic pages are *diagrammatic*, extending the function of punctuation within the linear text to the page level, displaying relationships such as segmentation, sequence, balance, and salience graphically rather than lexically and syntactically (Waller 1982; 1987).

This work was an attempt to account for the illustrated reference books that emerged in what we can now see as a golden age of layout, the 1970s and 1980s. Publishers such as Time-Life, Reader's Digest, Dorling Kindersley, and others developed a new genre that, inspired by magazine design,<sup>9</sup> used the double-page spread as a unit of meaning.

The diagrammatic quality of these books – typically on hobbies, sports, history, or travel – brought layout to the fore. They were developed by multidisciplinary teams in much the same way as films are produced. Unlike the traditional book, in which the author's voice is primary, in these books, the writer fills in spaces to order, and provides functional text such as descriptions and captions on request from editors, illustrators, photographers, and designers.

Then there is a *generic* perspective used in design. Layout is the main signifying feature of many familiar document genres: for example,

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9 See White (1982) for insight into the magazine designer's craft.

newspapers, magazines, textbooks, user guides, packaging, and reference books. These everyday genres owe their very being to their layout. When readers see them, they know what they are, and what to do with them. The graphic layout of such genres effectively contains the rules or affordances for their use: Engaging layouts and large headings invite the magazine reader to browse; the orderly layout of a user guide invites systematic reading, referencing a task outside of the text through diagrams, and providing large numerals as a visual target to the returning reader.

Considered as ‘rules for use,’ such aspects of layout can be thought of as *access structures*. In earlier work, I have distinguished this from the complementary use of layout to convey *topic structures* (Waller 1991), which are motivated by structures inherent in the author’s topic as distinct from the reader’s task. Together with *artefact structure* (which arises as a by-product of manufacture and is unmotivated by communication goals), characteristic combinations of these structures account for the typical structure of document genres of the kinds just listed. Delin, Bateman, and Allen (2002; see also Bateman 2008) further developed this model into a fuller account of genre structures, elaborating in particular the notions of artefact structure and topic structure.

Genres are natural categories identified by a language community – the primary evidence for their existence is the development of a name: magazine, newspaper, textbook. When we need a new name we invent one (‘blurb,’ for example, to describe publishers’ eulogies), and sometimes we subdivide genres into new subgenres (newspapers became broadsheets or tabloids).

A related concept is *pattern language*, with the key difference being that this is an exercise in naming common configurations that exist but, unlike genres, have no naturally developed name. It originated with the architect Christopher Alexander (1977), who developed names for successful configurations in towns and buildings. His pattern descriptions include definitions of common problems together with recommended solutions. They not only offer architects a repertoire of solutions that, Alexander argues, reflect the way human settlements naturally evolve, but they provide names that enable the patterns to be discussed and specified. This approach was taken up in a significant way by software engineers who needed to find a way to describe common programming objects (Gamma et al. 1994), and from there it was picked up by interface designers (Tidwell 1997/2005) and eventually by document designers (Waller & Delin 2010; Farkas, Larson, & Naranjo 2011).

These approaches (formal, diagrammatic, genres, and patterns) have one thing in common: they assume that readers combine a focal awareness of the words they are reading or the part of a picture they are inspecting, with a subsidiary awareness of the whole graphic page. ‘Focal’ and ‘subsidiary’

are the terms the philosopher of science Michael Polanyi (1969) used to describe a form of holistic perception he called ‘physiognomic.’ At one level reading a page is a little like recognizing a face – you don’t inspect the eyes, the nose, and the mouth separately but in one take. This makes layout challenging for technologies or analytical frameworks that fail to go beyond the linear default.

### Linguistics, semiotics and layout

Given that for the most part there is little authorial control of layout, and therefore little intentionality imputed to it (in a novel, for example), it is not surprising that for many years it was largely ignored within linguistics. But during the 1990s there began to be growing interest in multimodality, and in the extension of discourse analysis to graphic aspects of documents. This work typically drew on structural linguistics, discourse analysis, and genre theory as its starting points. In an important early contribution, Bernhardt (1985) ranged genres on a spectrum from the visually informative (in which layout and typography variation are prominent) to the visually uninformative (linear text), and explored the parallels between the two in terms of Halliday and Hasan’s (1976) structural linguistics.

Kress and van Leeuwen (1996) similarly used Halliday’s structural linguistics as a starting point but within a social semiotics perspective. They develop an influential account of the ‘grammar of visual design’ that they apply to a range of multiple modalities. Addressing layout, they suggest that verbal and visual elements interact in three key ways to create cohesive pages.

*Saliency* refers to the manipulations of the viewer’s attention through such things as relative size and contrast. *Framing* refers to the dividing off or enclosing of text elements. So far so good, but their concept of *information value* is more controversial. It asserts that different zones of a page – left, right, top, bottom, centre, and margin – carry distinct significances. For example, they assert that the left-hand side of a multi-column page carries given information (things the reader already knows) and the right-hand side carries new information (extensions to the given, things at issue).

Although they produce some examples of, in their terms, grammatical or ungrammatical pages, these are quite limited in number, seem to be selected to demonstrate the point, and underplay the variety of layouts that can be found. Moreover, the left–right distinction appears to assume we read pages in a linear manner, whereas the way information is, in their terms, framed or given relative saliency may encourage alternative sequences.

Consider the examples I introduced earlier. In Figure 5, the left-hand page shows how to plant three kinds of rose. Each is given a similar heading,

and the order is almost certainly dictated by the proportions of the pictures: standards and climbers are both tall and narrow, so fit well side by side, leaving bushes and the descriptive text to fit in with each other. I cannot see Kress and van Leeuwen's semiotic significances instantiated in this page, beyond the uncontroversial notions of framing and salience.

Of course, if we are studying at the level of the word or sentence, we have access to vast databases of real language, known as corpora, with which to test our hypotheses. Corpus linguistics has become a major resource for contemporary linguistics, supplanting the limited sets of idealized or sampled text used in the past. So scholars studying multimodal sources also need access to this kind of resource – for example, to test Kress and van Leeuwen's proposed information values.

Bateman, Delin, and Henschel (2004) critique Kress and van Leeuwen and address the issue of how a multimodal document corpus might be constructed. Bateman's (2008) major review of the field reveals some of the difficulties to be faced. In particular, he notes that

A substantial set of problems is raised by the fact that the object of study is not linear, either temporally or in terms of the principles for its consumption; moreover, its multichannel nature makes it difficult to reconcile and peg together the methods of recording, transcription, analysis and annotation that have been developed separately for each mode. This makes empirical study and validation of theory particularly problematic: we have not had the 'orderly arrangement of the objects upon which we must turn our mental vision' (cf. Descartes, Rule V of Rules for the Direction of the Mind, 1701) and, partly as a consequence, analysis has remained overwhelmingly impressionistic. (Bateman 2008, 272).

There remains the question as to whether the annotation of material going into such corpora could ever be automated, or whether it will always remain dependent on 'impressionistic' analysis. Will computer pattern recognition ever be sophisticated enough to emulate the gestalt structures seen by human readers, to use physiognomic recognition, or to spot generic resonances – those visual, holistic features of a visual display that go beyond what is defined in the markup languages (such as XML) that lie behind many modern documents? And will anyone ever think it worthwhile spending the time and money reaching that goal?

A study by Thomas (2009; see also Thomas, Delin, & Waller 2010) illustrates the challenge of handling layout in a multimodal document corpus. A multimodal document corpus must allow users to search via the usual verbal strings and tags, but also to search by layout properties and to view the actual document in facsimile. This means a considerable amount of expert annotation at the input stage, which discourages the development of large enough corpora to make computer analysis worthwhile.

## Layout in the digital age

### Digital genres

The genre approach asserts, in effect, that if there is a consistent human need to communicate in a particular way, then a corresponding genre will probably emerge. Or if, as with letterpress printing, that need is not met, it will re-emerge when technical developments allow it.

Although the digital age has made massively more documents available to each user, it is still struggling to evolve a common basis for a digital literacy – an agreed set of tools and techniques that enable us to study, understand, and retrace our steps through information, as well as to find it and connect it (both of which the digital age does supremely well). It is an evolutionary process; for example, when publishers turned to interactive CD-ROMs in the 1990s, they were rejected by the marketplace. Now those same publishers are tentatively moving back to similar formats for the Apple iPad, which provides a smoother delivery path and a better user experience.

Paper documents often evolved through a process of initial exploration and natural selection, followed by conservatism as production patterns settled and formats became familiar. Document genres – categories such as ‘book,’ ‘newspaper,’ or ‘leaflet’ – typically evolved out of the functional requirements of their producers and users. Even when the original production constraints change, genres survive because their users have conservative expectations. So readers of novels expect seriffed typefaces and straight right-hand edges; readers of newspapers expect narrow columns. Readers are conservative and want to minimize their effort to understand – genres represent a secure way in which writers can meet readers’ expectations, and in which readers can understand the rules for reading any genre-conforming document. We know from its format what the status of a paper document is, and what to do with it: whether to keep it or discard it; whether to read it carefully or skim; even whether to treat it as entertainment, or as of serious import.

Something similar has to happen with digital documents, and it will happen through creative explorations of compelling interfaces and devices, rather than through the deliberations of academic researchers. It has been noticeable that the popularity of tablet computers has spurred on magazine publishers to experiment with innovative page based formats.

As a *New York Times* piece put it:

You’ve got to hand it to the magazine publishers. They continue to throw spaghetti against the iPad and other e-readers trying to see what will stick and what falls to the floor. (Bilton 2010)

To date, most present their readers with defined, bounded content that, even when using interactive or video content, retains the page model (often

vertically stretched) and eschews the infinite extension into hypertext and social interaction that characterizes most newspaper websites.

### Documents as memory tools

Digital genres are developing, and will continue to develop, particularly where they afford some functionality that was previously impossible. In particular, the digital world has not yet finished evolving usable formats for managing the conversational dimension of websites. The same format is used for a handful of comments on a blog as for thousands of comments on a national newspaper's website: a continuous scrolling page (sometimes sliced into multiple pages), unsorted and unedited. Just as we learn to filter out irrelevant noise when have a conversation in a crowded room, we have to develop effective filters in order to find, read, and store online information discerningly. As with other areas of human activity, we just need the right tools.

Online channels give us incredibly effective tools when we are hunting for information. The question remains, though, whether we yet have the right tools for dissecting, cooking, and eating the information we have hunted down. Conceptual thinking is about manipulating ideas. For example, with paper documents we might:

- *Focus* on an idea, integrating representations of it from different sources – for example, a set of different documents, viewed together, open at relevant pages.
- *Compare* more than one document, point for point. People often do this by annotating documents or transcribing concepts into tables or diagrams.
- *Park* an idea, so that it is in view but not in play, to remember the fact of its existence. People typically write notes for this, or leave books open on a desk.
- *Connect* a number of concepts, from inside and outside of the document to hand. People sort documents in piles, use colour-coded bookmarks, or make lists and sketch diagrams.
- *Prioritize* among a set of possible directions for our thinking. People may transcribe ideas into numbered lists, or sort documents into piles.
- *Annotate* a text element, to capture a thought before it escapes. People underline or highlight documents.

Some of these commonplace behaviours are still hard to achieve with the current generation of digital documents.

This is why Sellen and Harper (2002),<sup>10</sup> in their seminal study of document use in organizations, noted that the default pose for many readers they observed (not just writers) was with a pen in their hand, ready to annotate the text or jot down new thoughts. In fact, their remarkable conclusion was that in the digital age paper is primarily an interactive medium, not a storage medium.

The life cycle of a document, as they observed it, moves between digital and paper versions: marshalling and extracting information (digital for search, paper for integrating multiple sources), writing (paper for planning, digital for drafting), editing/proofreading (paper), finalizing (digital), distribution and workflow (mostly digital), reading/consuming (paper better for longer documents), archiving/filing (digital). Paper is used by many as a temporary interactive medium: documents are printed out for reading, annotation, comparing, and sharing – then recycled while remaining accessible in digital form. As they put it:

We argue that we are not headed toward offices that use less paper but rather toward offices that keep less paper. This is because we will continue to need paper for some of the critical work activities we do, but in these roles it will be very much a temporary medium. (209)

Of course, the judicious use of memory, and therefore of memory tools, involves forgetting as well as remembering. In a recent critique of the concept of ‘lifelogging’ (the ultimate digital capture of every memory), Sellen and Whittaker (2010) suggest using psychological principles from studies of human memory as design principles for digital memories. Keeping the memory-tool metaphor in mind, this means designing digital formats that ‘strategically target the weaknesses of human memory.’ They outline what this means: for example, selective capture of information, aiding metacognition and metamemory, and designing effective retrieval cues. This more or less describes a book: curated, coherent, and designed to support strategic reading. But in the digital age this can be done in a way that is personalized, up-to-date, and configurable by the user.

Paper is not only essential for people wanting to spread ideas on the table and annotate them. It also has speed and continuity advantages over many current digital formats, such as the *Guardian* spread in Figure 1. Its readers must move around not only with their eyes (as did Saenger’s medieval readers) but via trackpads and keyboards, and perhaps even search boxes, with resulting time delays and additional cognitive load. Nielsen (1993) reported that time delays during the use of interfaces causes readers to be distracted by a loss of fluency and loss of direct control.

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<sup>10</sup> Although at the time of writing, this study is already 10 years old, in 2002 electronic documents, e-mail, intranets, and the Web were already well established in all large organizations.

In addition to time delays, the physical position of content in linear digital documents is usually not constant. This fluidity is also potentially disruptive, as there is experimental evidence to back up a common observation that readers use their memory of the physical location of ideas on a page when searching for previously read (see, e.g., Dillon 1991; Rothkopf 1971).<sup>11</sup>

#### Four aspects of digital pages

Hypertext prophets used to speak as if the advent of digital text were a paradigm shift, incommensurate with past ways of thinking and acting through text. It is perhaps more common now to speak about the convergence of technologies and channels. In that spirit I identify four page archetypes that reflect generic resonances from the past, the continuing need for traditional functions of the document, and the technical capabilities and connectedness of the current world (Table 1).

*Fixed* pages are the most diagrammatic. Because they are locked in place, the reader can assume that relationships between elements (text blocks, pictures, headlines, etc.) are intentional and potentially meaningful. A page break signifies the end of a unit of text, in the same way as a sentence or a paragraph. The designer and writer, for their part, can craft graphic relationships, knowing that they will survive the various technical transmission processes and reach the reader.

*Flowed* pages are represented by traditional novels, or by e-reader books. The author's words are flowed in and fill the pages one by one, with page endings that are as arbitrary as the line endings are. But those page endings are fixed for the life of the document (or, in the case of e-documents, until the text is reflowed after a change of font). Readers can therefore move back and forth between pages and use the constant geography of the book to navigate.

*Fugitive* pages are formatted temporarily and perhaps also populated with content temporarily. Pages are created afresh for each reading, and may change when revisited. A common example is an online newspaper, which offers a reasonably coherent appearance and user experience but is constantly updated. If you return to a story later in the day, you may find that it has been relegated to a lower position in the hierarchy or even disappeared from view. Even if it is still there, the content may have been edited.

*Fragmented* pages are compilations of page elements from a variety of sources that may not have any relationship predictable by their authors.

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<sup>11</sup> I wrote a short critique of hypertext in its early days, entitled 'What electronic books will have to be better than,' which highlighted the role of physical constancy in enabling intensive study, using an active reading strategy (Waller 1986).

Table 1. Traditional and emergent page types coexisting in digital documents

	<b>Fixed</b>	<b>Flowed</b>	<b>Fugitive</b>	<b>Fragmented</b>
<i>Definition</i>	Text and image locked in fixed positions.	Linear text flowed into page templates.	Pages are created dynamically at point of use.	Pages assembled from multiple sources.
<i>Typical purpose</i>	Explanation.	Narrative.	Community.	Enquiry.
<i>Example</i>	Magazine. Reference book designed in pages or double-page spreads.	Traditional printed book. e-reader book (eg, Kindle).	Online newspaper.	Search results Aggregator software (eg, Flipboard).
<i>Impact on content and layout</i>	Content and layout fixed, although may be scaled up or down.	Content fixed. Once flowed into template, layout is fixed until new edition produced (or, in the case of e-readers, new design parameters applied by user).	Pages created afresh from data + rules, so looks different on each channel or device.	Pages created from search system, so assembled from multiple sources.
<i>Editorial control</i>	Designer controls and crafts, with words edited to fit. Complete control within restrictive canvas constraints (page boundaries).	Writer controls and crafts, with advisory and proof-reading support from editor. Minor role for designer. Unconstrained by page boundaries.	Writer may craft linear text within content management system. Designer creates templates for text to flow into. Little control or crafting. Content and layout managed through programmed rules.	Reader sets and tests rules. Little crafting or editorial control, except through strategies such as search engine optimisation.
<i>Reader control</i>	Look and read. Using gestalt perceptions of structure. Moving from focal to peripheral awareness of static information to view, and place memory of information already viewed.	Read Building mental representation of structure. Reading strategically to check and reinforce those structures. Moving back and forth between static pages.	Click and read Similar to flowed text, but with less reliability when revisiting previously found information.	Click, read, click, read Building mental representation from multiple sources. Sophisticated levels of inference needed to integrate fragments.

An example is the result of a search, or an aggregation application such as Flipboard (which assembles content from a range of the user's favourite sources, such as blogs or social networking sites, into a magazine-like format).

These page types may exist in pure form or coexist in combination. For example, an online newspaper may have fixed layouts into which fugitive content is flowed, and a column of fragmented advertisements drawn in through personalization rules.

Illustrated textbooks and catalogues are a common hybrid of fixed and flowed text. Pictures or marginal notes need to be related to specific points in the text, so two columns may flow together through the book.

### **Layout and graphic literacy**

I have discussed the relative difficulty in delivering fixed, laid-out pages via digital channels that are designed to deliver flowed, fugitive, and fragmented text. I now consider a different kind of barrier: the skills needed to produce effective layout, and the low priority that it is given within many information-providing organizations. I use the term 'graphic literacy,' although this is to extend a term that is more often associated with the ability to interpret pictures and charts.<sup>12</sup> In everyday usage the term 'literacy' usually refers both to the ability to read and to the ability to write prose.

Most Western countries have very high rates of prose literacy – around 99% is typically claimed – but much lower rates of functional literacy:

Even the most economically advanced societies have a literacy skills deficit. Between one-quarter and three-quarters of adults fail to attain literacy Level 3, considered by experts as a suitable minimum skill level for coping with the demands of modern life and work. (OECD 2000, xiii)

As we have seen, adult literacy tests go beyond prose literacy to include document literacy and quantitative literacy. Tests of document literacy claim to measure the ability to use complex documents (which include many different text features in addition to continuous prose) in order to do tasks that involve departing from the linear structure to search, compare, make inferences, and solve problems.

So we might construe graphic literacy (or more specifically, typographic literacy) as the key difference between prose literacy and document literacy. In other words: *document literacy = prose literacy + graphic literacy*.

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12 The International Visual Literacy Association (IVLA) acknowledges the existence of a multitude of definitions of visual or graphic literacy, remarking on their website that each scholar has produced his or her own ([www.ivla.org/org/what\\_vis\\_lit.htm](http://www.ivla.org/org/what_vis_lit.htm), accessed February 12, 2012). Brill, Kim, and Branch (2007) attempted to reach agreement among experts, with limited success.



The document is poorly designed on several levels: it fails to use well known genre rules, it fails to use layout and design features to direct attention and afford effective use, and its content relates to a highly local and specific system. If a user fails this literacy test, whose literacy is lacking: that of the user or of the document creator? David Hamilton and Mary Barton are key figures in the 'new literacies' movement, where specific literacies are identified among different discourse communities (usually called 'situated literacies,' but for clarity in this context I call them 'conversational literacies'). They define this approach in the same article:

Our approach is based upon a belief that literacy only has meaning within its particular context of social practice and does not transfer unproblematically across contexts; there are different literacy practices in different domains of social life, such as education, religion, workplaces, public services, families, community activities; they change over time and these different literacies are supported and shaped by the different institutions and social relationships. (Hamilton & Barton, 2000: 379)

So ideally, then: *document literacy = prose literacy + graphic literacy + conversational literacy.*

Conversational literacy describes our understanding, either as creators or users of communication channels, of how a particular communication is shaped by its conversational context. It recognizes that each participant brings his or her own motives and experience to a conversation, and it understands how any document is likely to be interpreted in a particular context and the range of inferences that it is reasonable for readers to make.

### Producers and consumers: an imbalance of access and skills

When discussing document or digital literacy, we sometimes forget that traditionally we speak of literate people as being able to both read and write. Applying the same principle to document literacy, this means that a failure of communication may be blamed on the literacy skills of both producer and user.

The most sophisticated written documents are produced by individuals who have highly developed skills of writing, editing, and design, working in industrialized systems of production and distribution. Their skills are held in the form of procedural knowledge developed among communities of practice, and learned through apprenticeship, rather than declarative knowledge taught through formal grammars.

Page-based (normally, paper) channels, in their most evolved forms, involve an imbalance in the access to communication channels of elite producers (in the form of authors and publishers) and consumers. Digital channels are now open to all, but the skills required to communicate effectively are not universal.

The problem of competence is a key problem when we consider layout as an aspect of text that carries meaning. When linguists study spoken language by recording speakers, they accord them respect by attributing variations from 'standard' forms to such things as dialect, mood, or context. But when we study written language, and in particular typographic layouts, it is hard to avoid distinguishing between trained and untrained writers and designers. Although they are typically called 'expert' and 'lay' designers by researchers (see, e.g., Walker 2001), if they were to be considered equally competent, there would be no such profession as graphic designer.

How, then, might we extend the concept of relative document literacy to the document producer? Fully document-literate document creators (whether persons or organizations) must work at three corresponding levels, measurable through user testing:

*Prose level:* They must be able to write fluent, and readable prose – the traditional criterion for an educated, literate person.

*Graphic level:* They (if necessary collaborating with a designer, or using templates) must be able to use layout and typography to create a usable environment for searching, skimming, and seeing content structures diagrammed, as well as the close reading of prose. We could go further and say that they must be able to use alternatives to prose, such as pictures, diagrams and charts, where these would be more effective.

*Conversational level:* They must create an encounter of user and document in which a range of appropriate behaviours, reader roles, and critical stances is made obvious, and in which key prior knowledge or postreading actions are made plain.

An example might help to explore the distinction between the graphic and the conversational levels. The official document in Figure 8 fails on all three counts:

- *Prose:* It is written in bureaucratic language unsuitable for a general audience.
- *Graphic:* Its structure is poorly articulated graphically, with numerous ways to structure and highlight information used simultaneously.
- *Conversational:* It does not make its function clear, or the process of which it is a part.

In some ways, this documents reflects the IALS test in Figure 7. It shows a similar lack of design competence, and is similarly adrift from the range of everyday genres that readers are used to. Successful readers of either document have to imagine a possible world in which it makes sense, and within which they can make inferences about intention – in much the same

BUPCN\_0312\_0526 RBG 03/12/2008 Rev:120

**BOROUGH OF MANTON**

**PENALTY CHARGE NOTICE**  
 Bus Lane Contraventions (Penalty Charges, Adjudication and Enforcement) (England) Regulations 2005

Date of Detection: 24/11/2008

Vehicle Registration Number: **L 2009EX**  
 Penalty Charge Notice: **RG80506710**

Date of this Notice: 03 Dec 2008

**DO NOT IGNORE THIS NOTICE**

Manton Borough Council believes that a Penalty Charge is payable with respect to the above vehicle, for the following alleged contravention:  
 Being in a **Bus Lane** (as defined in S.144(5) Transport Act 2000).  
 The vehicle was seen in (Place) **STATION APPROACH (WEST TO EAST)** at 11:19:22 on 24/11/2008. The alleged contravention was noted at the time by Camera Operator **RG175** who was observing real time pictures from the roadside camera at the time stated above. This alleged contravention is supported by video evidence.

You must either pay the Penalty Charge Notice or make representations to the Council by 07/01/2009.  
 Pay the Penalty Charge of **£60** by 07/01/2009. IF PAYMENT OF THE PENALTY CHARGE IS RECEIVED BY THE COUNCIL WITHIN 14 DAYS OF THE SERVICE OF THIS NOTICE A REDUCED AMOUNT OF **£30** IS PAYABLE.  
 Or, if you believe you have valid reasons, you can make representations against paying the Penalty Charge. The grounds on which you can make representations are set out overleaf. Any representations made outside this 28 day period may be disregarded by the Council.

**IF YOU DO NEITHER OF THESE THINGS WITHIN 28 DAYS FROM THE DATE OF SERVICE OF THIS NOTICE, THE COUNCIL WILL SERVE A CHARGE CERTIFICATE INCREASING THE PENALTY BY 50% TO £90. AT THAT STAGE IT WOULD BE TOO LATE TO MAKE REPRESENTATIONS.**

**BOROUGH OF MANTON**

**PAYMENT SLIP**

PENALTY CHARGE NOTICE NUMBER: **RG80506710**  
 DATE OF NOTICE: **03 Dec 2008**  
 VEHICLE REGISTRATION NUMBER: **L 2009EX**

**RETURN ADDRESS**  
 TO: Manton Borough Council BL  
 PO Box 4649  
 Worthing  
 BN11 9FB

Please debit my MasterCard/Visa/Switch/Delta Card (Delete as appropriate)

Card Number: \_\_\_\_\_  
 Amount £: \_\_\_\_\_  
 Issue Date: \_\_\_\_\_ Expiry Date: \_\_\_\_\_  
 Issue Number: \_\_\_\_\_ Name of Cardholder: \_\_\_\_\_  
 Cardholders Address: \_\_\_\_\_  
 Postcode: \_\_\_\_\_  
 Signature of Cardholder: \_\_\_\_\_

If payment is made by post please detach this slip, complete the details above and return it with your payment to the address shown.  
 If you require a receipt please tick the box. A stamped SAE must be enclosed.

**BOROUGH OF MANTON**

**Bus Lane Penalty Charge Notice**

This is an important notice. Do not ignore it. You must either pay the penalty charge or challenge it by 05 September 2013.

This Penalty Charge Notice is issued under the Bus Lane Contraventions (Penalty Charges, Adjudication & Enforcement) (England) Regulations 2005.

Notice date: **06 August 2013**  
 Reference: **MN1234567**

**Your car was photographed in a bus lane**

Date of photo: **03 August 2013**  
 Time: **12.33**  
 Vehicle: **AB51HTY**  
 Place: **Station Approach**  
 Evidence: **Video (operator MN175)**  
 You are entitled to view this. Write to us at the address below or phone us on 01234 000 0000.

**The penalty**

<b>£30</b> if you pay by <b>22 Aug 2013</b>	<b>£60</b> if you pay by <b>05 Sept 2013</b>	<b>£90</b> if you pay later.
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**How to challenge**

If you wish to challenge, see the back of this form for instructions. You must contact us by 17.30 (5.30pm) on **05 September 2013**. You will not have to pay the penalty while we consider your appeal. If we refuse your challenge we will give you a new date by which you will need to pay the penalty.

**How to pay**

Notice date: **06 August 2013**  
 Reference: **MN1234567**

**By phone**  
 Call 0845 1234567 with your credit or debit card details.

**In person**  
 You can pay by cash, cheque or card at the Civic Offices, Mon-Fri 9.30-5.30, Sat 9.30-1.00.

**Online**  
<https://secure.manton.gov.uk/parking/>

**Manton Borough Council**  
 PO Box 2323  
 Worthing  
 BN11 9XY

**By post**  
 Send this slip with a cheque paid to Manton Borough Council, or enter your card details here. Send a stamped address envelope if you need a receipt.

Name on card: \_\_\_\_\_  
 Card number: \_\_\_\_\_  
 Start date: \_\_\_\_\_ Expiry date: \_\_\_\_\_  
 Issue number: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Signature of cardholder: \_\_\_\_\_

Left. Figure 8. An official notice about a traffic violation (from Waller 2012). Original size A4.

Right. Figure 9. A redesigned version of the Penalty Charge Notice (a speculative draft by the author, not implemented).

way as when reading an ungrammatical sentence, we try different meanings until one of them appears to makes sense in context.

The redesigned version of the Penalty Charge Notice (Figure 9) has a clear visual pathway that corresponds to an explanation pathway: this is what happened, here is the proof, this is what to do next, and this is how to do it.

Ideally, document designers can take an existing genre as a model – something shared with their readers in a given discourse community. Official documents like this one, however, are encountered too rarely in the lives of individual to establish strong genre conventions. One of the problems with the original version is that it shows evidence of excessive repair: over-signalling is often the result of attempts to overcompensate for poor reader responses.

In the absence of a strong genre, the new design falls back on the core techniques of clear information design: the content is organized as a narrative, told in the left-hand column, with very clear framing (the horizontal rules). What happened (and the evidence); what is the penalty (and how much); then finally a choice of appeal or pay. With a pattern language perspective, it follows a strong procedural ‘action and result’ pattern found more frequently in user guides. This kind of layout would not be out of place in a quick start guide to tell users how to install an ink

cartridge in a printer or how to program a digital watch. The payment area at the foot of the page borrows a payment slip pattern from utility bills.

In this section I have been concerned to place layout at the heart of document literacy and communication competence. Traditionally, page layout is the province of specialist graphic designers, who are normally employed only on a limited range of documents. But if what they do makes an important contribution (and I believe it does), then it deserves to be seen as a core communication competence that every communicator shares, that every communication tool enables, and that every student of textual communication recognizes.

## Conclusion

Information, knowledge, message, and document: each word brings its own personal, social, and technical perspective.

In our discussions of knowledge management in the digital age (the context in which this paper was originally presented), we should not forget that documents are more than linear text. They are multimodal juxtapositions of elements whose spatial relationship may be every bit as intentional, essential, and effective as the order of words in sentences. Making documents, transmitting them, archiving them, repurposing them, integrating them into the social context of the connected digital world: these are challenges in which the subtleties of crafted displays are easily lost while we focus on the newer technical challenges involved in managing large numbers of documents, and in tracking complex conversations.

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