

The Unbound Book

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Writing differently in the digital era

Hamlet in Hyperborg

JOOST KIRCZ AND AUGUST HANS DEN BOEF

In this paper we argue that the inherent potential of digital technology enable us to write scholarly and educational texts more effectively. In narrative prose fiction, the author strictly determines the reading path.¹ In scholarly and educational writing, when it is also about literary texts, the author tends to wish to cater to a variety of different readers. Hence, it is desirable to provide the opportunity for readers to follow many different reading paths, in order to facilitate various purposes such as exploration, learning, and research. In print, we are already familiar with books with dual reading tracks, one for the general understanding and another for more in-depth knowledge. A famous example is the textbook *Gravitation* by Misner et.al. (1973), which Kaiser extensively discusses (2012). But in a digital environment we can easily enable a plurality of reading paths in educational and scholarly texts. In order to accommodate these, we will stress the importance of enabling a structural change in discursivity in the transition from paper to electronic substrates. It goes without saying that such a development demands new sets of tools to be developed.

By a structural change in discursivity we mean the way in which the intrinsic capabilities of the medium allow narrative elements to be disposed. This is more than adding embellishments, such as the addition of the rattle of the dying or the primal scream of the new born, by way of an 'audio-illustration'. Textual and non-textual components alike may actively add to the argument, depending on their value. Are we content with the metaphor of a scream in the form of a picture, or do we need the very scream itself? The new technologies extend the discursive capability of the human author.

This issue is becoming more and more important as, at present, we see the transfer of traditional paper-based books to a great variety of electronic books. These electronic books or e-books can be displayed on two very different kinds of screens: the stable and very readable but not very dynamic e-ink based readers, and the dynamic but less comfortable LCD screens on laptops, tablet computers, and smartphones. These differences impose limits on what multimedia components can be used by the author. As technology continues to develop, comparative in-depth studies have been performed in order to draw general conclusions. However, many studies of only a few years ago on the technological and ergonomical aspects of e-readers are already obsolete due to this rapid development. In general

we can say that though linear reading of fiction or non-fiction literature is possible on an e-ink reader such as the Amazon Kindle or Kobo Touch, in the case of educational and scholarly texts, paper versions are still widely preferred for study, whilst their electronic representations are well accepted for reference and look-up (e.g. Ackerman & Goldsmith 2011, Siegenthaler *et al.* 2011, Cull 2011, Woody 2010). The question remains, under what conditions can a book incorporate multimedia components in such a way that the reader enjoys and prefers the electronic form above a printed version?

Historically 'the Book' has been considered a convenient object composed of bound printed paper pages. At present we are in the process of redefining the notion of the book, and we see a discussion on what we understand by e-books (e.g., Cramer, Kovač, this volume). In 2008, Vassiliou and Rowley already catalogued and analysed 37 definitions of e-books to conclude that: 1) 'An e-book is a digital object with textual and/or other content, which arises as a result of integrating the familiar concept of a book with features that can be provided in an electronic environment', and 2) 'E-books, typically have in-use features such as search and cross reference functions, hypertext links, bookmarks, annotations, highlights, multimedia objects and interactive tools'. They pose that: 'A two-part definition is required to capture both the persistent characteristics of e-books, and their dynamic nature, driven largely by the changing technologies through which they are delivered and read'. Hence, the new issue at stake is not only to what extent the representation of book content in e-versions equals paper in its ease of use but also what more the author can do, using the inherent properties (Van der Weel 2011) of electronic-based methods for conveying the author's message and meaning to the reader.

The main thrust of this contribution is that, contrary to post-structuralist thinking, in an electronic environment we need a well-structured practice to enable the environment's essential property: its capacity to connect any element in its network to any other element. Below, we investigate what tools are required for creating new educational and scholarly works. In doing so we hark back to the original fundamentals of a proper hypertext system that enables the author to create a new way of structuring his or her narration while at the same time enabling the reader to follow various reading paths.² The key issue is that hyperlinks – the bidirectional linking of two or more text or media 'chunks' – should have a rhetorical meaning and are not just unidirectional 'see also' indicators as we know them at present.

In this article we mainly deal with educational and academic texts. It goes without saying that literary works can perfectly follow the methods we propose, but the essence of a literary work is that it is primarily the author in his or her time and context that takes the narrative and structural lead, leaving it to the reader, most often in quite another context and time, to make sense of it. In educational and academic texts, the primary purpose is to elucidate issues to others (colleagues, students), and to present insights or conclusions, which does not necessarily imply

following the author's reading path – page by page, exactly as the book or paper is written. Kircz (1991) makes the following distinctions between different types of readers of educational and academic writing: a) the non-reader – the university administrators and others who count and archive output; b) the informed reader, who is a colleague in the same field, knows what he or she is looking for, and therefore reads very selectively; c) the partially informed reader, who might be a novice in the field and skims the work for possible clues to the issues discussed, and finally d) the uninformed reader, who is the person that wants to learn something new and hence reads the work conscientiously from beginning to end. It goes without saying that, in a real-life academic environment, one and the same person may play one or more of the roles thus described. Hence, an important implication of this notion is the necessity for the structure of an electronic publication to be such that each type of reader can select his or her own (reading) path. This dovetails with extensive research in reading and information retrieval (IR) practices on the way in which readers look for components in research papers and how for that purpose journal articles, for instance, can be *disaggregated* into their components – abstract, underlying data, conclusions, bibliography, and so on. Researchers then reaggregate the components into new structures (see Sandusky and Tenopir (2008) and references therein for a fine overview).

1 The historical context

While it may seem as if digital media facilitate a straightforward conversation between a multimedia author and his or her reader, we feel the need to review certain aspects of such an assumption. This is necessary because new technologies change the way in which we express our reasoning and feelings, but they do not necessarily change the goal or directions of that reasoning.

In the development of writing, there have been clear structural changes arising as a consequence of the interplay between a new medium (stone, clay, paper) and its attendant technologies and a new, often larger, audience emerging as a result of the ever growing number of copies involved. In considering these changes, it is important to make a strict distinction between the copying of an existing text into a new medium and the development of qualitatively new ways of presentation suited to a new medium (see also chapter 3 of Van der Weel 2011). As many books have already described the evolution from clay tablets to the printing press and the consequences for the structure of the narrative,³ in this section, we will only touch on select aspects by way of examples and metaphors for our argument.

Ong (1982) and Eisenstein (1979) have extensively treated the development of the book and textual fixity.⁴ The problem of fixity is often addressed in new media discussions. Unfortunately, in many of these discussions, three different issues are often mixed up. One pertains to the very existence of the content; the second to the reliability, or continued integrity of the content (or parts of it) in a medium that

is often regarded as ethereal, and the third to the very different ways a reader may move through the text.

Thus firstly, we have the text (or other media components) as published the first time. This version is simply there and will only vanish if deliberately all copies, including all backups and – in the case of an Internet publication – also on all servers, are erased on the level of the file itself. The whole field of digital forensics is built on this fact (Kirschenbaum 2007).

Secondly, the pristine version can be easily ‘improved’ or added to or otherwise changed, by deliberate editing by the author or by others. However, unlike in the old days, when unknown scribes changed and improved or corrupted copies, every digital change has a retrievable digital signature: for instance, the date-and-time stamp and the IP number of the connection of the collaborator who added to or even changed the material in the original version. Hence, in the digital environment a work may exist in a plurality of versions. However, the author(s) of the original content can declare a particular version the right or definitive one, at a certain moment. For academic papers, this is normally the version that has been accepted and published by a scholarly journal. In the same vein, Van der Weel (2003) makes a distinction between the instability of form and content, on the one hand, and ‘existential’ instability on the other. The formal aspect is related to layout and representational media (from paper size to browser technology) and it demands, if we want the form to remain fixed, the integration of form and content in one file, such as a PDF file. Existential instability is a new phenomenon: an example is rendering a web page built up from various external databases that could be as ephemeral as spoken words. Nevertheless, just as the spoken word has been captured by the tape recorder, so are websites – temporarily – stored in the cache memory of the computer used or on the big servers of data stores and warehouses.

The third issue is that of the various ways a reader may move through hyperlinked text. This has the effect that no two readers will necessarily read the chunks of which it consists in the same order, or read the same amount of text: the text is ‘fluid’ from one reader to the next.

The cultural consequences of fixed text have been listed well by Eisenstein (1979; mainly chapters 2, 6, and 8):

- the reusability of old works or parts thereof;
- an enormous growth in the dissemination of identical information;
- the emergence of standardization of presentation and judgement;
- the development of typography;
- new forms of data handling;
- the possibility of error correction.

As discussed in detail by De Waard and Kircz (1998) in scientific articles, a distinction should be made between functions that are related to the technology used (general presentation – typography, page numbers, etc. – and registration and indexing systems) and functions used in order to enhance communication per se

(see below in section 3). In the digital world, all of the six points made by Eisenstein continue to be relevant. At the same time, there is in the new medium a proliferation of versions, comments, pastiches, analyses, and re-creations that can be edited, changed, and reused, without – in principle – much ado, on a scale and with an ease that are quite unique to the new environment. So, in the afterlife of a once-published digital treatise, a multitude of new texts and other media expressions emerges around the original content that could be represented by a tight web, or better graph, with vertices and edges of different quality, certification, and value. In order to extract those elements that are useful for a particular reader, a whole novel set of tools is needed. Defining those tools goes hand in hand with defining how best to publish a digital text.⁵

The history of written text is rife with examples of the development of reading aids such as word separation, spacing, punctuation, page numbers, easily readable type fonts, and other features that we now regard as ‘normal’ (Cavallo, 1999; Parkes, 1999; Saenger, 1999). New tools will likely look like old ones, but unless we cast the work into a fixed unity of content and form, such as in a PDF file, some aids, such as page numbers, may disappear altogether. *Digital Humanities Quarterly* (<http://digitalhumanities.org/dhq/>) has solved the lack of page numbers by counting paragraphs. This way of avoiding page numbers harks back to the practice of numbering verses in the Bible, but it need not be seen as an instance of technology forcing us into ‘going backward’. After all, in most cases paragraph numbering gives a greater granularity than page numbering for looking up parts of text and communal reading.

There are other aspects of text production in which the past can be instructive for our view of the present and our expectations for the future.⁶ As has been stated many times, commencing with the printing revolution itself, too much information will only drive people mad. Freedom of the word is essential, but it cannot be equated with drowning in bit streams. In the present, just as in the past, making sense of cultural developments means systematizing, structuring, and comparing experiences, information, and knowledge. In the digital era, we are only now taking the first steps in an attempt to do so, as all instances of human utterances are now on one unique – digital – platform available for structuring, indexing, and deep analyses. In exploring *digital born* writing, we explore at the same time the pros and cons of replicas of old forms of expression in a new environment, as well as the need to determine common ground by mutually agreed structuring.⁷

At present we witness two not fully antagonistic developments in such structuring. On the one hand, we have massive research endeavours that use probabilistic methods to sieve through and filter information chunks, on the basis of their context, from the enormous flood of web documents. On the other hand, we have the development of the semantic web (<http://www.w3.org/2001/sw/>), in which the emphasis lies on properly naming information objects and their relationships. Below, we discuss what new structuring tools can and should be created within the general philosophy of the semantic web.

2 The challenge of Hypertext

In the 1960s, Ted Nelson had already founded the Xanadu project, the principal insight of which was that ‘if text and other media are maintained as referential structures, the resulting structure will have powerful advantages over merely moving the contents around’ (<http://www.xanadu.com/tech/>). Nelson became a keen critic of the World Wide Web, as he considered it too ‘chaotic’:

Its one-way breaking links glorified and fetishized as ‘websites’ those very hierarchical directories from which we sought to free users, and discarded the ideas of stable publishing, annotation, two-way connection and trackable changes. (Nelson 1999)

Mainstream web development followed a pragmatic path, and Nelson’s critique is still valid. Hypertext – the system of linking parts of text to other parts of text in an ineradicable way (in the sense, described above, that later versions can always divert from the original) – has been around since the late 1980s (Conklin 1987) and became a fertile ground for web development and index and ontology studies.

However, its expression as web over the pre-cursor of Internet changed the world. This is the hypertext success story of Tim Berners-Lee (Berners-Lee and Cailliau 1990) using HTML (HyperText Markup Language). This language followed the hierarchical model provided by SGML (Standard Generalized Markup Language, ISO 8879).⁸ While being a great step in the process of international standardization of machine-readable documents, SGML was complicated and in many ways a restrictive model, based on the notion of independent files in a hierarchical file management system. The watered down version HTML also considers objects as independent bricks linked together with untyped hyperlinks between them, excluding the possibility of overlaps and it became the engine for the hypertext web explosion. While the Web as such is non-hierarchical, all individual HTML and XML documents that make up the ‘docuverse’ are hierarchically structured.⁹

The central issue for educational and scholarly materials is that we want a free and certified, that is to say authoritative and validated vis-à-vis quality, roaming through large numbers of texts, pictures, and various versions thereof on the one hand, and, on the other hand, scaffolding, railing, indexing, and signposts. In cultural studies, hypertext is often seen as the model and tool for fluid, unfettered communications (see, e.g. Landow 2006). A critique of the over-enthusiastic acceptance of hypermedia by post-structuralist thinkers is given by Cramer (this book).

In educational publications, we find many examples of hypertext in the form of various pieces or chunks of text, pictures, graphs, and video and audio files tied together through the usually blue-coloured clickable standard hyperlink. However, the question remains whether that is enough, and the immediate answer is ‘No’. The navigational technology is still too primitive. First and foremost, the fact

that present-day hyperlinks are still not bidirectional means that reading a book with four fingers between the pages is just as easy as, if not easier than, reading the same book in e-form and using the 'go back one page' button in a browser. The advance of 'bookmarks' in modern e-books is a fix to make up for the lack of bidirectionality. Present day e-ink readers allow for links within a document but not yet between documents. The page, be it a book page or a web page, which is only a geometric container of content, remains the prime logistic aid, despite the odd experiment with other kinds of markers, such as the above-mentioned numbered paragraphs in the *Digital Humanities Quarterly*. The fundamental problem is that we 'link' from a position in a text to another file or page and not to another position in a text. This is also the essence of Nelson's critique. We are not able to have a patchwork of 'cuttings', 'clippings', or loose pages in front of us as raw material for a new work, because we miss the appropriate tools to put these chunks of material at our fingertips. Despite all fantastic advances of the last years, in storing complete libraries and complete journal editions from issue one in retrievable repositories, we still have to address this fundamental problem.¹⁰

The second, equally severe problem, whose impact is especially strong in the context of academic publications, is that links are not typed: a link is a link is a link. For the sake of clarity, we discuss here only links between documents. Links are also possible and widely used within documents. Many a discussion has taken place and attempts have been made to address this deficiency, but, in practice, no publications exist yet in which links also have a well-defined meaning. We just click from one place to another, without any indication of why, other than the knowledge that the author has felt some need to point us in a certain direction. In that sense, the hyperlink is like the footnote – it can prove and claim anything, but it is often broken, which is similar to a reference mentioned in a footnote that is not available to the reader (for a nice overview of the various roles of footnotes, see in particular chapter one of Grafton 1997).

A third issue is the need to take into account the argumentative nature of a scholarly or educational text. The author of such a text wants to convey knowledge and meaning based on theory and facts, which is very different from the conveyance of meanings and emotions in literary texts. Given the fact that the Web allows all types of discussions and interactions, research on structures to facilitate comprehension by the reader within this *mer à boire* is plentiful (see Schneider *et al.* 2012 for a recent extensive overview). In the research field of scientific communication, some work has been done to try and develop argumentation schemes as a limited structure for 'typed' hyperlinks (De Waard and Kircz 2008, Kircz and Harmsze 2000, Harmsze 2000). In those works, which are a continuation of earlier work done by, for instance, Trigg and DeRose in the 1980s (reviewed by Harmsze 2000), a clear division is made between links that organise the structure of the text and links that indicate reasoning such as explication, elaboration, or worked-out example.

In the current essay, it is suggested that distinct textual modules should be defined in an attempt to *disaggregate* the standard presentational form. The organisational relations, materialised in typed hyperlinks, are those that are the basic ‘road signs’ in the modular structure and deal with the whole module and not parts thereof. Think about the ‘administrative/bibliographic’ module – the bibliographic references – and the sequence of modules such as introduction, methods, experiments, results, and discussion. Relations in the so-called scientific discourse call for a different kind of typed link. Here the links deal with understanding the underlying reasoning. For these types of relations, a taxonomy based on the Pragma-dialectical method was developed. This method has as its goal the organisation of discourse activity in the real world, when people are trying to convince one another (Van Eemeren and Grootendorst 1992; for a short discussion, see <http://en.wikipedia.org/wiki/Pragma-dialectics>). These links are composed of two groups: a) relations explicating communicative intent, such as elucidation and argumentation, and b) content relations, such as similarity, synthesis, causality, and elaboration.¹¹

Dancing from hyperlink to hyperlink does provide us, in principle, with much more information than we ever were able to access with the help of a good library, as we now have the content of all libraries available to us online, but this does not necessarily deepen our understanding, as long as the reason for the linking is not clear-cut. Typed hyperlinking is essential in order to cut one’s way through the jungle of the World Wide Web, but given the limits of present-day technology, we are forced to rescue integrity through writing a well-reasoned explanation before we suggest a link for the reader to follow. This reasoning ‘around’, for instance, a bibliographic reference is the subject of computational methods for identifying the meaning of a part of text (Angrosh 2012). In other words, in a digital environment, authors should not be allowed any longer to just enter a hyperlink to some other entity without explicitly saying why. In scholarly communication, this should become an imperative. No bibliographic reference should be accepted without a strict reason of why it is cited. (Such a practice would, incidentally, also immensely improve the whole field of citation studies, as it will immediately provide the significance of a citation, instead of the actual non-discriminatory counting and normalising. After all, a reference in the introduction of a paper has a completely different significance than one in the methodology section.) We suggest that a formal typology of hyperlinks as a method of pre-coordinating should be much simpler than deriving the meaning later on through parsing techniques, such as information extraction and summarisation methods. Obviously, a typed link can have multiple indicators or metadata, such as date, author, meaning one (agree with), meaning two (elaboration), and so on.

In conclusion, this means that in order to allow authors (and commentators or annotators) to use hyperlinks as argumentative navigation a tool, a formal technology has to be developed. If we have such tools, working with them is a matter of metadata management. The various types of links that are considered desirable

within a specific work will depend on its genre and level of scholarly depth. Within an application, it should be possible to switch such a tool on or off, so that the text is not littered with links, allowing a reader to remain at the level of complexity that fits the demands of the moment.

Typed hyperlinks, apart from being bidirectional, are not symmetric at all. If a reference is made to another author, the significance of this reference is only symmetric in the simplest cases of, for instance, mutual agreement, mutual disagreement, or the catchall ‘see also’ symmetry. In all other cases, a hyperlink is asymmetric. This means that if, say, I refer to another person’s work and cite a sentence from it, I do this for a specific reason. However, the author being cited or simply referred to has, in most cases, neither knowledge of nor a qualified opinion about my writing.

As long as hypertext tools are still defined within the paradigm of office automation and disallow proper argumentative reasoning, a real breakthrough will be difficult. In that sense, we can refer to Shillingsburg’s outcry that for scholarly editions, we simply miss the tools to make them convenient for readers and textual scholars alike (Shillingsburg 2009). The task upon both authors and editors to define these tools is now pressing.

3 Structure as glue between author and multiple readers

Text that has been put to paper as the author created it is the basis for various ways of reading. Though most people read novels without a pen or pencil in hand, this is different for scholarly and educational texts, as dealt with in this paper. Here, the text is a point of departure or an ingredient for further study and understanding. Humanists made a clear break with the scholastic past in the late fifteenth century, when the book began to be used for annotations and for abstraction and reformulation of the content by the reader (a new way of reading well described by Grafton 1999). It is important to keep a keen eye on this, as present technology struggles with the capacity to add notes, scribbles, and annotations to electronic versions of books and articles. These obstacles have to be removed before a fully electronic writing and reading environment will flourish.

A second fact stressed by Grafton is that people in the past diligently copied large parts of texts, and even whole texts, not only from manuscripts but also from printed books, a technique that was used until the advance of the photocopier. Copying a cherished fragment of text, among other reasons, served an important purpose of internalising its content. Of course, this has much to do with the ancient craft of memorising. In the electronic environment, where ‘cut-and-paste’ is now possible, the question arises as to what extent the loss of this internalisation by reiteration, be it by uttering a memorised text or by manually copying it, might signify a change in the depth of understanding. Further research on electronic learning environments must solve this issue. An important implication of the

above is that in the creation of new structures for text presentation, not only the level of information coupling but also the coupling of understanding is at stake.

4 The Darnton model

At this point, it is useful to compare our reasoning with that of Darnton in his often-quoted pyramidal layer model (Darnton 1999). Darnton contrasts the use of hyperlinks with a 'layered cake' model of book publishing:

The top layer could be a concise account of the subject, available perhaps in paperback. The next layer could contain expanded versions of different aspects of the argument, not arranged sequentially as in a narrative, but rather as self-contained units that feed into the topmost story. The third layer could be composed of documentation, possibly of different kinds, each set off by interpretative essays. A fourth layer might be theoretical or historiographical, with selections from previous scholarship and discussions of them. A fifth layer could be pedagogic, consisting of suggestions for classroom discussion and a model syllabus. And a sixth layer could contain readers' reports, exchanges between the author and the editor, and letters from readers, who could provide a growing corpus of commentary as the book made its way through different groups of readers.

In this model, Darnton misses the essence of hypertext by sticking to a hierarchical model of different – isolated – reading modes. The issue here is that hyperlinks are not just footnotes but, in our opinion, refer, with a reason, to various relevant texts, which Darnton puts in his fourth layer. A properly structured hypertext work comprises all the aspects mentioned in Darnton's list. The quintessential point is that the hypertext version, which can change in time due to continuously added new materials, discussions, and edits, is the new e-book. The next question is then: which reading path does a particular reader want to follow? Darnton's six layers are places where the author can address and therefore in fact enable certain – horizontal – reading paths. Our point of view is not a conflation of all these paths but an argument that, while reading, one should be able to make shortcuts or diversions and thereby enter the various Darntonian layers. At some points in the texts and at some moments of digesting the material, a reader might be interested in some further details. For instance the family relations of the leading character in a scientific biography who is a descendant of famous scientists and married into another famous scholarly family, whilst the same reader may want to skip all elaborations on geographical aspects and related discussions and comments. Hence, a structured typed-hyperlink typology needs to be flexible enough to allow comprehensive reading and at the same time prevent the reader from going too far astray in the embarrassment of richness. A publication model on the

basis of modules, as described in the next section, may provide a more suitable alternative for publication in this respect.

Harmsze (2000) worked out in the greatest detail a ‘modular’ model for a text enriched with typed hyperlinks, to be applied in the field of Physics. The model allows various reading paths in addition to its reliance on a completely different kind of summary or abstract. A summary is most often a contracted version of the full text. But that is not always the case. An abstract of a seventeenth-century treatise on natural philosophy written for engineers can be completely different from an abstract written for philosophers. The first category of readers is likely to be more interested in the mechanics of the reported experiments, whilst the second category of readers may be more drawn by the interpretation and general context of the work. For the different types of abstracts of a scientific hypertext paper, we refer to Van der Tol (1998). His conclusion is the following:

In a modular electronic environment, the abstract has primarily an orientation function. It fulfils this function best when it provides a balanced representation that refers explicitly, in the informative mode, to the various stages in the problem-solving process. It also has to contain labelled links that connect phrases of the abstract to the related modules of the article. At least each main module of the source text should be linked to the abstract.

Part of Van der Tol’s work was an attempt to determine the extent to which the strict modular structure enables a coherent new form of scholarly discourse. After all, a scholarly article is an argumentative – often problem-solving – story that is characterised by many repetitions and iterations. In that sense, strict modularisation that is simply disaggregating a work into its constitutive elements might be too strong a demand. The conclusion that can be made is that it is possible to apply modularisation to standardised publication formats, such as academic journals in material sciences and biomedicine. This method might prove to be problematic, however, if we extend it to include the modularisation of school courses in an electronic learning environment, because here it is often the case that students of different background need different presentations of the same material.

In the actual example given below of the use of hypertext to create parallel and overlapping discourses, we have to constantly keep in mind what the balance is between form and content. The necessary technology is a consequence of that. So, we don’t argue what can be done with the present-day technology, but what ought to be done given the implicit capabilities of these techniques. In this example, we try to illustrate how the ideas of asymmetric bi-directionality of links and rhetorically structured modules can become guidelines to writing in the field of humanities.

5 *Hamlet* in Hypertext: An Example

Shakespeare's *Hamlet* is a well known, highly popular, and often-studied piece of literature, and as such it is a good basis for the discussion of our model and its pertinence for humanities scholarship. We take two examples of writing about *Hamlet*, both of which accord with the standard rhetorical scheme of an argumentative text, such as an academic paper. In the problem-solving process that academic papers try to reflect, the steps involved are as follows:

- introduction of the investigation;
- outline of the research process;
- description of the environment, tradition, and context in which the research takes place;
- development of own novel research activities;
- conclusions made on the basis of the research;
- reviewing other authors' results and ideas on the same subject;
- thoughts on further/future research.

In what follows we conceptualise a structure for more-or-less closed and comprehensive short pieces of texts that fit within each slot of the above scheme. A relatively independent but self-sufficient piece of text, which fits this Lego-brick paradigm, we call a module, in accordance with previous work mentioned above. Modules, in other words, must be self-contained and comprehensive chunks of text. Note that the length of these texts is not a factor at all. In that sense, the restriction is more rigid than the idea of 'lexia' – the somewhat arbitrarily delimited excerpts of a few words to a number of sentences that capture and convey meaning in the 'best possible' way – proposed by Roland Barthes as the smallest narrative unit.

With the modular scheme thus in place, we next propose two types of authors that may be associated with a scholarly inquiry: in our concrete case, we consider a Shakespeare scholar and an educational author to be pertinent examples. While these types of authors would each adapt their writing to their intended reading public, both narratives will be part of one hypertext network, comparable with George P. Landow's Victorian Web (www.victorianweb.org), a large and comprehensive repository on 'the literature, history, & culture in the age of Victoria'. Though, based on a clear hierarchical structure, and including many illustrations, the Victorian web lacks the important characteristics of typed, asymmetric links discussed above, and, hence, remains within the limits of the present commercially available tools.

As a third way of writing, we can envision a transformation of the play itself, according to the above argumentation scheme, which would make it a newly structured literary hypertext work. As a result, we will end up with another version of the same play, which can be juxtaposed with the original one. Below we expand on two examples; one a scientific article and the other an educational one.

First module: Introduction

In our rhetorical scheme, we start by introducing the scholarly inquiry. This stage-setting phase can be manifold. For the sake of this example, we take on the task of examining the sources on which the story of Hamlet is based. For the educational version, we may skip the too-obvious overview of Early Modern English or the study of the structure of a Shakespearian play; instead, we may concentrate on a more contemporary aspect: what were parent-children relations like in the past? Note that we are talking about two new digitally born texts, about, but independent of, the original one: Shakespeare's *Hamlet* and obviously with links to the digitised full-length text of Shakespeare's *Hamlet*, as well as to other relevant texts.

What will emerge therefore are two different discourses that are parallel to each other. This means that in the introductory part or module, we will find two different introductions on why and how *Hamlet* is used as starting point, with reference to the original text where pertinent. To do that, we will need a standard version of *Hamlet* to which all references in the texts will point. In certain cases, versions of the source text of the play, which act as bases for the educational or scholarly work, might differ. This means that our resource can be linked to a scholarly edition that has all annotated versions of the various editions of *Hamlet*.¹²

In this introductory module, we also refer, with due credits, to all relevant authors who have already published on the subject and discuss these works briefly in order to explain the importance of our own work and the contribution that it makes to the field. The hyperlinks to these other works will indicate if we are in agreement with, feel neutral about, or are critical of these works.

Second module: The research process

In the second module, we deal with the articulation of the purpose of the article that the scientist or the educational author is writing. For the scholarly study, the search for relevant material might cover any topic connected to or treated in the play – from the psychological problems of a boyhood deprived from fatherly care to the religious undertones pervading the play, but, as mentioned above, for our purpose here we choose to concentrate on finding the literary-historical sources of the story and the influences of other authors on the composition of the play. For instance, we know from studies on Shakespeare (Bevington 2011) that he had knowledge of ancient as well as contemporary literature, as well as a keen feeling for the fashion of his period. Shakespeare in his plays paraphrased parts of Thomas North's translation of Plutarch's selected *Lives*, and occasionally quoted from the *Gesta Danorum*. He had read English writers such as Geoffrey Chaucer, Edmund Spenser, and Philip Sidney as well as translations of classical drama. At the same time, he was up to date with the new school of drama writing as exemplified by his contemporaries Thomas Kyd and Christopher Marlowe. So, in discussing the possible influences, links to the digital works of these authors will be incorporated into the new publication.

For the educational track we may want to explore the route of relating the play's storyline to a contemporary context, for instance, by posing the following question: to what extent are family relations among the sixteenth-century Danish royalty different from relations among present-day royalty, about which, we can reasonably expect, schoolchildren know a lot, given the excessive media coverage that members of the royal family receive, in addition to what they might have read in novels that take this theme as a leitmotif. Here, for instance, the aforementioned theme of the psychology of boyhood deprived from a father figure can become relevant and thus be duly treated. (Note that the beauty of a network consists in the ability not only to refer to other studies in a footnote but also, in principle, to incorporate the entire source to which a reference has been made, thereby making it an integral part of the discourse.)¹³ At the same time, we can make some side-steps into the historical basis of the Hamlet family and its relationship to older sagas, which creates a direct connection to the scholarly trail, where these references might be discussed as well.¹⁴

Third module: Context

In the next module, the introduction and the description of the research are welded into the larger framework of our example of authoring specific research projects.

The new scholarly text may put an emphasis here on identifying and analyzing the stories that somehow may have influenced the writing of *Hamlet*. The linking to or incorporation of electronic resources available on the Internet is relatively straightforward. However, in this, we may be confronted by the possibility of manuscripts that deal with sixteenth-century issues being physically scattered around the world. Old manuscripts that may have influenced Shakespeare, directly or indirectly, might be lost since he started researching the material for his play. We have to find them in order to be able to argue that Shakespeare used them or not. Copies or versions of relevant sources could be in libraries or even in private collections. If so, part of the research environment can be a digital library of indexed and hopefully scanned documents. As long as the digitisation projects of archives remain incomplete, physical visits to them will be necessary. This means that in the research environment, strong emphasis must be given to searching and retrieving techniques. The methodologies used will be fully described in this module with pertinent references to the tools and software used. The example of discovering the sources for *Hamlet* can even be cast as an exercise in defining the methodological requirements for a study of old manuscripts and books, partly overlapping with actual methods for old texts comparison and analysis and partly as a 'Catalogue raisonné' of sources that go beyond solely bibliographic metadata.

In the educational track, we see a real opening for integrating multimedia in education. To build on an earlier example, here, the basis for comparison between the Danish Hamletian court and present-day royalty, forms a starting point and outline for discussing various royal cultures. This outline, which is the core of this module, is obviously based on historical as well as popular sources, includ-

ing the avalanche of motion pictures that try to be faithful to the director's and producer's best knowledge of the period. A link between the educational and the scholarly is also easily made if we give students the exercise to search for relevant and reliable information on the subject. For this assignment, the students might be asked to try out two different ways of obtaining the necessary information – by using the scholarly track within the current electronic resource and by searching on the Internet. This might be an excellent opportunity for them to experience directly the difficulties associated with online research, which often relies on keyword search (think of words such as 'royalty', which, of course, can also mean a percentage of the sales price or net profit for authors, or 'family', which is really a catch-all for everything that has a relationship with something else).

Fourth module: Development of own research activities

In the context of a scholarly research project, the informed user might find the modules discussed thus far to contain rather well-known matter. In the fifth module, however, the scholarly author's own research activities are reported. Here, the sleuth, as it were, tries to resolve the research quest of module two, within the given context (module three). Here is the place to discuss findings on the basis of the methodologies described in the previous module. The scholarly author may have found serious works that might or even must have influenced Shakespeare, such as the *Oresteia* and *Gesta Danorum* and the works of Aeschylus and Saxo Grammaticus. Here is where the author can compare the various sources, and so it is in this module that we touch on the field of scholarly annotated editions of *Hamlet*. Contrary to traditional practice, extensive quotes from old works need not be just cut and pasted. In a hypertext environment, we can incorporate the quotations in such a way that the reader will be able to switch between the full-text quoted source and our electronic resource on *Hamlet* and can continue reading the quoted source as long as he or she pleases. It goes without saying that typing the hyperlinks will give the reader a clue as to why he or she should follow it. In a bidirectional typed-hyperlink system, the same reader can then switch again, if need be, from this source text to another treatise, by a different author, that deals with the same source. The whole point is that switching lanes is a well-structured and reasoned activity thanks to the very structured nature of our electronic resource.

For the educational track, say that we now have drawn up a historical overview of royal parental cultures and want to compare this with modern royal families. As *Hamlet* is a northern European, the most obvious example that comes to mind is the British queen, Elizabeth II, and her son Charles, who, it is rumoured, is not on the friendliest of terms with his own father, Prince Philip, though the latter is still around and still happily married to her, as far as we are given to believe. In the Netherlands, we have Queen Beatrix and her son Willem, and the two, at least from what is publicly known, seem to enjoy a good relationship.

Fifth module: Conclusions

After introducing the research topic and describing the research process and the context in which the research project was carried out, the meat on the bone is the presentation of the conclusions that the author of the educational or scholarly text finally arrived at. In the scientific investigations, we conclude that Shakespeare's *Hamlet* is clearly inspired by older sources; in particular, Shakespeare based *Hamlet* on the legend of *Amleth*, preserved by the thirteenth century chronicler Saxo Grammaticus in his *Gesta Danorum* as subsequently retold by the sixteenth century scholar François de Belleforest. He may have also drawn on, or perhaps written, an earlier (hypothetical) Elizabethan play known today as the *Ur-Hamlet*.

In the educational track, we can argue, for instance, that parent-children, and in particular mother-son, relations are strongly determined by the social-historical context. These psychological conclusions can be connected to other studies, classic as well as modern, where this issue is at stake. In the first half of the twentieth century, when psychoanalysis was at the height of its influence, its concepts were applied to *Hamlet*, notably by Sigmund Freud (on dreams and the Oedipal desire for his mother; Freud 1913), Ernest Jones (1949), and Jacques Lacan *et al.* (1977); these studies have sometimes influenced theatrical productions, too. So in a comparative study of parent-children relations among the royalty, such studies might be helpful.

Sixth module: Overview of other authors

In this module, we look back on our own conclusions and examine what others have said on the same subject. Here, each reference to others will have a distinct rhetorical meaning. This makes the notion of typed hyperlinks immediately clear: we agree or disagree with or call in to rescue or debunk other authors' analyses and conclusions.

In the scholarly track, we are confronted, for instance, by an array of sources claiming that the sixteenth-century author François de Belleforest was the sole source for the *Hamlet* play, as Shakespeare, and other contemporaries, might not have had access to older sources and so were not aware of them. But, as little is known about Shakespeare's life, many theories have been put forward about who he 'really' was, given his simple background. One of the most well known of these propositions is that it was Francis Bacon who wrote *Hamlet* (*Britannica*, 1911). At present, the so-called Oxfordians, who are convinced that Edward de Vere, the seventeenth Earl of Oxford, used Shakespeare's name for his literary works, contest all other candidates, including William himself (<http://www.shakespeare-oxford.com/>). So, in fact the whole validity of the question 'who influenced Shakespeare' can be challenged.

In the educational track, we are confronted by the fact that we have dealt with protestant royalty, whereas the Roman Catholic Church claims eternal family values that transcend social-economical circumstances (John-Paul II, 1981). Hence,

we have to bring this into the discourse, as it is an important ingredient for understanding the full range of parental relationships among royalty.¹⁵

Seventh module: Future research

As in every narrative, life goes on in the ‘ever after’. The scholarly track may end with the evergreen catchall that more research is needed, and digitising more archives is imperative in order for this research to be carried out. The educational track, in turn, may recommend further research into the family dynamics of non-protestant royalty, such as Catholics and Muslims, for instance.

5 Conclusions

Table 1

Original Linear text	Educational modular text	Scholarly modular text	Argumentational Scheme
<i>Enter KING CLAUDIUS, QUEEN GERTRUDE, HAMLET, POLONIUS, AERTES, VOLTIMAND, CORNELIUS, Lords, and Attendants</i>	Parent-children relations were different in the past	On which sources is <i>Hamlet</i> based?	Introduction
KING CLAUDIUS Though yet of Hamlet our dear brother's death The memory be green, and that it us befitted To bear our hearts in grief and our whole kingdom To be contracted in one brow of woe, Yet so far hath discretion fought with nature That we with wisest sorrow think on him, Together with remembrance of ourselves. Therefore our sometime sister, now our queen, The imperial jointress to this wamike state, Have we, as 'twere with a defeated joy,-- With an auspicious and a dropping eye, With mirth in funeral and with dirge in marriage, In equal scale weighing delight and dole,-- Taken to wife: nor have we herein barr'd Your better wisdoms, which have freely gone, etc.	Let us compare royalty now and in 16th-century Denmark	Try and find earlier potential sources and influences	Outline of the research process
	Prince Charles is angry at his mother too	In libraries, we find <i>Oresteia</i> and <i>Gesta Danorum</i>	Environment/ Context
	An outline of various royal-cultures	Manuscripts are scattered in repositories around the world	Development of own research activities
	Some parent-children relations are historically determined	Shakespeare is clearly inspired by the sources mentioned	Conclusions made on the basis of the research
	The Roman Catholic Church upholds eternal family values	Others claim the only source was the 16th-century author François de Belleforeston	Reviewing other authors' results and ideas on the same subject;
	We will look further at non-protestant royalty	A further inter-textual analysis is required	Thoughts on further/future research

Above, we have tried to illustrate that digitally born works need a new structure in order for users not to drown in the data stream but rather take a deep dive and return with the pearls. Electronic tools will be of great importance for changing nature of authorship and incorporating a work in the totality of electronic works. We schematise our example discussed above in Table 1.

New technologies enable new ways of offering a message to the reader. So, just as film became an inspiration for storytelling on paper, the use of hypertext and Internet-based features has become commonplace in modern writing of all kinds (see, e.g., Lightman's fascinating novel *The Diagnosis 2000*, where e-mail exchanges are clearly distinguished, and not only typographically, from the rest of the text).

However, the shift to the digital medium heralds a really new stage with two interwoven developments: the usage of the very new medium itself as substrate and network, on the one hand, and the metaphors in style that the new media provides, on the other. In this essay, we have dealt with the first thread by pointing out how in the new digital environment we can write quite differently from just mimicking paper forms. It is already amply clear (see also Cramer, this volume) that hypertext novels are not the success that their advent led many to believe they were. It is worthwhile to research further to what extent the lack of structure plays havoc, as well as to establish the degree to which the limitations of a strict modular structure are commensurate with that shortfall. As we have asserted, storytelling is characterised by many repetitions and iterations, and in that sense, modularisation might become too rigid a change of style, as repetition of an argument normally serves to enhance persuasion. This will be a serious issue in any attempt to make school courses modular; each module must in and of itself remain a comprehensive and self-contained exposé.

Another important novelty is that we can write texts that relate to one another and have cross-references, such as we tried to show with the two modes of discussing one classical play. In an educational environment, this can lead to various reading paths within one structured resource: one reading along the main lines and supplementary reading paths, where more detailed discussions are available. Take the well-known phrase in science books: 'after some algebra we obtain'; in a hypertext environment, the full mathematical digression can be part of the text (as a pop-up) and only displayed on request, for instance in preparations for an exam. The same idea can be applied to extra explanations on *Hamlet*, such as sources discussing sexual morals in the sixteenth century or Shakespeare's peculiar grammar and vocabulary. The ability to follow various reading paths in the network of modules will become essential.

In other words apart from new 'post-novel' narratives in hyperspace, digital techniques allow the juxtaposition of multiple versions, studies, and elaborations of a story. This helps enrich the way we convey a message, as contextual and background information can grow in time, not making the original a so-called 'living document', but rather creating a living habitat for the narrative. In such a habitat, new works can incorporate existing modules and need not just review what has already been published. With the bidirectional typed hyperlinks, new and old works become one fertile playgroup for structured learning and scholarly communication.

Finally, unbounding the book in this way is useful not only in the educational and scholarly realm, but also for the fiction and entertainment public, because of the new ways in which it allows stories to be (re-)told.

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Notes

- 1 Elsewhere we analysed the relationship between contemporary technology and its metaphorical expression in the story line of novels. Interestingly, we noticed that the backbone of the storyline remains in most cases the same; independently of the media used (Boef and Kircz, in preparation).
- 2 Obviously, this new way of structuring material will need to tie in with digital preservation and annotation efforts of existing texts and archives of source material.
- 3 Some important developments include changes in rhythm and rhyme to ease reading, increased sentence lengths, and the capability to refer to and from pages in a thick volume.
- 4 Adrian Johns has challenged Eisenstein forcefully on the issue of the transformative role of technology in his *The Nature of the Book* (Johns, 1998), and this has led to an interesting exchange of opinions (Eisenstein 2002a and 2002b; Johns 2002). The present authors fully endorse the Eisensteinian point of view.
- 5 In researching digital writing, it is important not to mix a critique or working around the limitations of existing tools, such as Microsoft Word, with the essential task of developing new 'system requirements' for writing and reading aids and tools.
- 6 Also on the way text is expressed and how the internal structure of a narrative and its presentation into a medium make deep inroads in the societal way of dealing with text and information, see e.g. of Goody (1986), Martin (1988), and Olson (1996). At every stage of implementing a new technology we have to take the change of use of the content into account, just as human consciousness changed considerable after the invention of writing (Ong 1983, 78). This contribution is not the place to dwell on this point more deeply, but just consider the cultural difference between the almost sacred value of an old book full of ancient wisdom and the whole of Chinese, Christian, Hindu, Islamic, Jewish, etc. mythology at one's Wikipedia fingertips.
- 7 For scientific e-born journal editing, see the proceedings of the sole international cross-disciplinary conference on this subject so far, which took place in 2001 and provides many examples, ranging from Comparative Law to Chemistry: *Change and Continuity in Scholarly Communications* <<http://web.archive.org/web/20051104080029/www.woud.niwi.knaw.nl/ccsc/index.htm>>. Interestingly, the pace of change in full e-journals in traditional fields is slow, as recent research shows (Mayernik 2007).
- 8 It is of great sociological interest to note that it was the stripped-down, simplified grammar of HTML that enabled the explosion of web pages. After it found its natural Waterloo, it was surpassed by the SGML 'dialect' XML (eXtensible Markup Language).
- 9 Of special importance is the parallel development of the Text Encoding Initiative (TEI), whose 'chief deliverable is a set of Guidelines which specify encoding methods for machine-readable texts, chiefly in the humanities, social sciences and linguistics' (<http://www.tei-c.org/index.xml>).

- 10 Note that in the field of academic publishing, links between works and their references are now globally implemented using the Digital Object Identifiers (DOI), a unique and most successful collaboration (<http://www.doi.org/>) between fiercely competing publishing houses.
- 11 This method for capturing the rhetoric of a scholarly publication is one of various attempts to do so (for an overview, see Buckingham Shum *et al.* 2012).
- 12 To illustrate the importance of this issue, we share an episode from one of the current authors' own past: the 1963 (10th) Dutch edition of *Hamlet*, which was published by the Dutch educational publisher Wolters and was a required high school reading at that time, included the following note, translated here into English: 'The text has been slightly expurgated'.
- 13 With concerns over copyright persisting, despite attempts at alternative systems of attribution, the described scheme might work best if implemented, for instance, within the licence system of a university library system or in a Creative Commons Licence environment.
- 14 In his article: 'The main literary types of men in the Germanic hero-sagas', van Sweringen makes a division between, among others: he hostile kinsman, The avenger; split into: The father, The Son and The Brother, and The Traitor. Sweringen (1915). We provide this old reference not because we know that it is the most relevant one, but to show that with the help of a good online university library, we can dig up many lost treasures and review them. In this reference the quests of parental relationships as well as the mythological aspects thereof are discussed.
- 15 We can entertain, for the sake of argument, the possibility that the historical Hamlet, if he ever existed, was Catholic. However, in 1537, Denmark became a Lutheran country, and Shakespeare lived from 1564 till 1616 in Anglican England. Hamlet and his friend Horatio attended the Lutheran University of Wittenberg. Moreover, the role of the only priest (in act v) is minimal and purely formal. Hence, Shakespeare's Hamlet is certainly protestant.