

Title: Website hierarchy and the interaction between content organization, webpage and navigation design: A systemic functional hypermedia discourse analysis perspective

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1. Introduction

A defining characteristic of websites as hypermedia texts on the Web is their fluidity, the quality resulting from a website's capacity for expandability and change and the ability of hyperlinks to obscure its structure and transcend its boundaries. Website fluidity grants users freedom of movement and is therefore indispensable to the Web's attractiveness. It also, however, carries the risk of disorienting users. The question of how this risk can be minimized while website fluidity is retained or increased is thus of central importance in website design.

According to the professional hypermedia design and usability literature, successful orientation depends considerably on users' ability to develop a conceptual model of the organization of information in hypermedia texts (cf. Badre, 2002; Fleming, 1998; Krug, 2000; Pearrow, 2000; Veen, 2000). This view is supported by empirical research of hypertext use (cf. Edwards & Hardman, 1989; Elm & Woods, 1985; Otter & Johnson, 2000) and is echoed in studies of hypermedia in education (Downes & Fatouros, 1995; Rouet & Lenoven, 1996). Because users explore websites by traversing hyperlinks from one webpage to another, their ability to build such a model is influenced by the interplay between a website's content organization, webpage and navigation design. The development of methods for facilitating user orientation, consequently, requires a model of the organization of information in websites that reflects this interplay and its influence on website use.

A key principle for organizing information in website design is the notion of website hierarchy. This paper develops a new conceptualization of website hierarchy that reflects the role of the interaction of content organization, webpage and navigation design in revealing, obscuring or transcending a website's hierarchical structure and thereby facilitating or hindering user orientation. This is achieved by adapting a tool for studying the structure of written discourse borrowed from systemic functional linguistics (SFL) to the analysis of websites as fluid hypermedia texts. The resulting conceptualization draws on the strengths of the two most common understandings of website hierarchy and reconciles their differences, which result from the tendency evident in the professional literature on information architecture for the Web, website design and usability to treat content organization, webpage and navigation design in isolation from each other, despite acknowledging their interdependency. The new conceptualization is thus a step towards designing a metalanguage that can be shared by information architects, interface designers, content producers, programmers, usability experts, and other website design specialists. A shared metalanguage can significantly facilitate successful website design, which always incorporates knowledge from a wide range of disciplines (Siegel, 1997; van der Geest, 2001).

This paper employs as case studies two popular websites for children – *CBBC Newsround* (British Broadcasting Corporation, 2001-2004) and *National Geographic Kids (NG Kids)* (National Geographic Society, 1996-2005).¹ Both are collaborative design projects, which – as is typical of children's websites – are part of larger organizational or corporate websites. Children's websites provide a rich ground for studying hypermedia texts as they epitomize two key challenges for hypermedia designers and discourse analysts. One is understanding what Lemke (2002) terms 'hypermodality', the meaning-making potential of the interaction between the two defining features of hypermedia texts – their hypertextuality and their multimodality (i.e. the interplay of different modes such as visual, verbal, audio and kinetic within and across webpages). Another challenge is accounting for the ways in which hypermedia texts achieve complexly interrelated purposes and address different types of users. Most children's websites aim to *both* educate or

inform *and* entertain children as their overt addressees, and can therefore be described as ‘edutainment’ or ‘infotainment’. At the same time, like most products for children, they seek the approval of parents and educators, their covert audience of adult-censors.

2. Websites as fluid hypermedia texts

To be able to evaluate the potential of different understandings of website hierarchy to reflect the interaction between content organization, webpage and navigation design, we need to introduce concepts for describing these dimensions of website design and their contribution to website fluidity and user orientation.

Being a hypermedia text, a website consists of webpages, that is nodes that incorporate visual, verbal and increasingly also audio and kinetic elements, and hyperlinks. A hyperlink is activated by selecting an **anchor** (a clickable webpage area). Each website can be indefinitely expanded as new webpages are added to it.

Webpages serve to present website content, typically in their **main viewing area**, which excludes the anchor to the homepage, the navigation bars which appear on most webpages within a website, website section or subsection, and any advertising banners. Another purpose of webpages, achieved through various interface design methods, is to reveal a website’s content organization and navigation options as well as a user’s position within a website. The application of these methods makes webpage design crucial for user orientation, as will be illustrated in Section 4.4.

According to website usability studies, for orientation into the website as a whole users rely considerably on the **homepage**. This can be explained with its threefold purpose:

- (i) to establish the identity and mission of the website
- (ii) to show visitors its main parts and preview any popular or timely information
- (iii) to reveal how the site is structured and what options for navigation it offers (cf. Krug, 2000; Nielsen, 2000; Nielsen & Tahir, 2002; Reiss, 2000).

Webpages other than the homepage are organized into website sections, which may be subdivided into subsections and so on. Each (sub)section has a **main page**, which usually presents and provides access to the (sub)section's main components. A main page's function in relation to its (sub)section is thus comparable to that of the homepage to the website, and at the same time differentiates main pages from webpages whose primary function is to present website content.

Hyperlinks can be defined as **website-internal** when they connect webpages belonging to the same website and as **website-external** when they transcend a website's structure. Whereas website-external links may blur the boundaries of a website, website-internal ones may obscure its structure. This potential is particularly high for surfacing and cross-linking website-internal hyperlinks. **Surfacing hyperlinks** allow users to skip levels in a website's structure. In *CBBC Newsround*, surfacing links allow users to access the latest news stories directly from the homepage, regardless of how deeply within a particular section each may be located. From the homepage shown in Figure 1, for example, users can directly access the story "Plan to stop illegal ivory trade" captured in Figure 2. This spares users from having to visit the main page of the "Animals" section (Figure 3), to which the story belongs, before they can access the story. **Cross-linking** enables direct transfers from a feature belonging to one section or subsection to a feature belonging to another. An example in Figure 2 is the anchor "Click to find out more about endangered species", which leads to a subsection of the section "Find Out". Such cross-linking allows users to reach related content directly, without visiting the main page of the section to which it belongs.



Figure 1. CBBC Newsround: Homepage



Figure 2. CBBC Newsround: “Animals”: “Plan to stop illegal ivory trade”



Figure 3. *CBBC Newsround*: main page of “Animals”

By enabling users to skip visiting the main pages of website (sub)sections, surfacing and cross-linking navigation options increase freedom of navigation. Such skipping, or **hypertextual ellipsis**, may obscure a website’s structure and disorient users. To avoid this risk, these navigation options must be supported by webpage design that clearly signals which section each webpage belongs to. The story “Plan to Stop Illegal Ivory Trade”, for instance, is marked as part of the section “Animals” through the following elements identified in Figure 2:

- (1) the “Animals” section icon
- (2) the highlighted state of the section’s anchor
- (3) the anchor’s connection with the border of the main viewing area.

Website content may be organized into website sections of different types. In website design only two types are commonly recognized: **content** and **functional**. Content sections contain information on a given topic or activities of a certain type (e.g. voting polls, chat forums, games, quizzes). Functional sections, on the other hand, inform users about the purposes, privacy policy,

content organization of the website, its designers, sponsors and/or the institution it represents. In children's websites, in addition to functional sections like "Site Map", "Help", and "Contact Us", there are also functional sections titled "Grown Ups", "Teachers", or "Parents", which explicitly address these websites' covert audience. As content and functional sections are found in every website, they can be defined as **core sections**.

Some websites also feature a third, optional, type of website section – **surfacing**. Like core sections, surfacing ones have their own main pages. The main viewing area of their main pages serves to offer anchors to features sharing a common characteristic which belong to the website's core sections. The main page of the surfacing section "Harry Potter" in *CBBC Newsround*, for example, offers anchors to features on the Harry Potter phenomenon found in different content sections of the website such as "Film/TV", "UK", "Vote", "Quiz", and so on. Like surfacing links, surfacing sections create alternative routes to selected content, allowing users to reach it without visiting the main page of the section to which it belongs. They thus contribute to website fluidity and should therefore be recognized in accounts of website content organization.

3. Reviewing existing understandings of website hierarchy

As many of the concepts introduced so far reveal, not all webpages and navigation options within a website enjoy the same status. This understanding underpins the notion of 'website hierarchy'. Although it is widely accepted that on the Web "[t]he foundation of almost all good information architectures is a well-designed hierarchy" (Rosenfeld & Morville, 1998, p. 37) (see also Andres, 1999; Fleming, 1998; Garrett, 2003; Krug, 2000; Lynch & Horton, 1999; Reiss, 2000; Sano, 1996; Veen, 2000; Wodtke, 2002), the term 'website hierarchy' has no unanimous definition. This can be attributed to the rarity of explicit formulations of its meaning and to the variety of dimensions which a representation of a website's hierarchical structure may reflect, such as "click depth, page type, logical grouping, major navigation path, link relationships within the site or out to other sites, access rights, etc." (Kahn & Lenk, 2001, p. 36). Among the many differences between uses

of the term, however, two dominant perspectives on website hierarchy can be distinguished. They are called ‘the segmental’ and ‘the holistic’ in this paper and will now be introduced and evaluated in terms of their ability to account for the interaction between a website’s content organization, navigation and webpage design.

3.1. Segmental perspective

The segmental perspective focuses on individual webpages rather than groups of webpages (hence ‘segmental’) and determines the level of a webpage according to the number of clicks required to reach it from the homepage (cf. Kahn and Lenk 2001, p. 22, 105). The dominant position of the homepage from this perspective can be explained with the following finding of many usability tests: when users first visit and decide to keep exploring a website, those whose encounter with it begins from a webpage other than its homepage always visit the homepage next in order to orient themselves within the site (Nielsen & Tahir, 2002, p. 1). From the segmental perspective, then, the position of each webpage within a website’s hierarchical structure is determined on a scale of *distance from the homepage*. The structure’s *horizontal dimension*, also known as ‘breadth’ or ‘width’, is determined by the number of webpages accessible from the homepage, and its *vertical dimension*, or ‘depth’, by the number of levels below the homepage. This view of website hierarchy is presented in a highly simplified form in Figure 4 (‘simplified’ because webpages one click away from the homepage rarely connect to only one other webpage). This conceptualization of website hierarchy dominates in usability studies, where the speed and accuracy with which users perform a pre-defined information retrieval or other task in a website are frequently measured by the number of hyperlinks users need to follow or webpages they need to visit in order to complete the task.

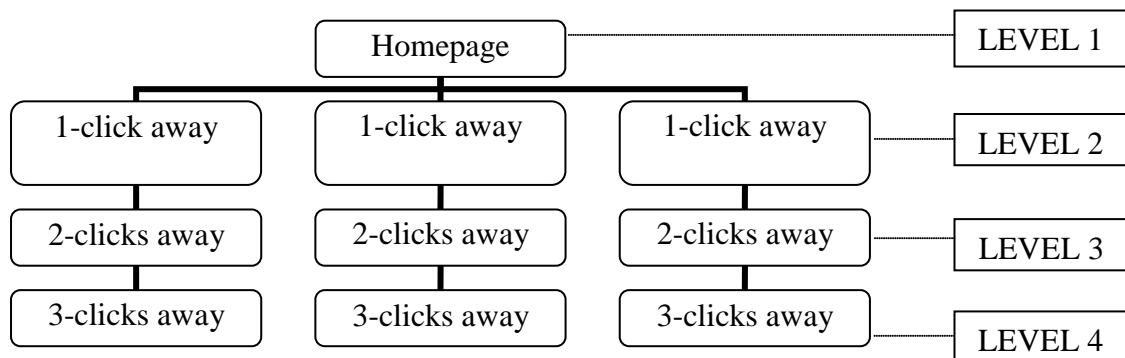


Figure 4. Website hierarchy from a segmental perspective

The main advantage of this perspective is that it draws attention to the step-by-step, dynamic, interaction characterizing the use of websites by foregrounding the fact that users usually explore a website by moving from one webpage to another. It cannot, however, reflect the function of webpages or their grouping into website sections with different purposes as it prioritizes expression/form over meaning/function, which is a serious disadvantage for functional approaches to designing and studying websites. To illustrate, the main pages of content, functional and surfacing sections will all be assigned to Level 2 if they are accessible directly from the homepage. Furthermore, a webpage presenting content that can be reached by activating a surfacing hyperlink from the homepage is likely to occupy the same level as the main page of the section to which that content belongs; this would prevent a webpage that functions primarily to present website content to be differentiated from one that offers an overview of a section's components and their relationships to each other. Therefore, the segmental perspective is unable to account for the interdependency between a website's content organization, webpage and navigation design.

3.2. Holistic perspective

From the holistic perspective, the highest level in a website hierarchy is the website as a whole (hence 'holistic'), followed by its sections, their subsections, sub-subsections, and so on, as presented in Figure 5. This perspective is popular in information architecture for the Web, where the focus is on organizing the information presented within a website. From the holistic

perspective, the *horizontal dimension* of a website is determined by the number of sections the information is grouped into, whereas its *vertical dimension* is defined by the number of subdivisions (subsections, subsubsections, sub-subsections, etc.) within these sections. Placing the website at the topmost and most encompassing level of the hierarchy implies that the webpages comprising it are not just HTML documents with hyperlinks between them, but that depending on its meaning each can form part of a larger group of webpages. This hierarchy can therefore be interpreted as based on a scale of *containment*, one where higher levels contain lower ones.

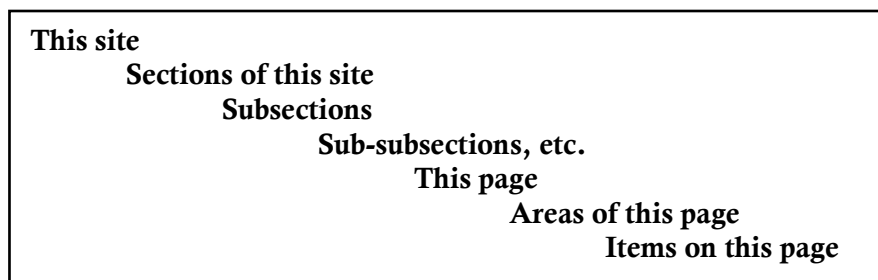


Figure 5. Website hierarchy from a holistic perspective (Krug, 2000, p. 64)

Like the segmental, the holistic perspective on website hierarchy has both advantages and disadvantages. An obvious advantage is that it places greater emphasis on the meaningful grouping of webpages. For studies of hypermodality, another advantage of the holistic perspective is that it acknowledges the role of webpage areas and items, and thus webpage design, in the construction of website sections (and their subdivisions) and of the website as a whole. In fact, because the arrangement of various webpage elements on the homepage serves to represent the website as a whole, from a holistic perspective the homepage is often associated with the highest level of website hierarchy (cf. Krug, 2000; Reiss, 2000; Sano, 1996). As this perspective suggests that some website sections may have more subdivisions than others within the same website, it can be used to model the *formal* distinction between functional and surfacing sections, on the one hand, and content sections, on the other: surfacing and functional sections tend to consist of a single webpage, while content ones have a more complex organization, which often involves the use of subsections, subsubsections, and so on. This model cannot, however, satisfactorily differentiate the *function* of either content from functional or surfacing from core website sections. Moreover, the reason why the holistic perspective cannot account for the

functional difference between surfacing and core sections is related to its main disadvantage – namely, that it is a synoptic perspective of website structure and does not attend to website navigation. To be a useful tool the interaction between the organization of information in a website and users' orientation within it, the notion of website hierarchy must reflect the interdependence not only between content organization and webpage design, but also between them and website navigation.

4. Reconceptualizing website hierarchy: a systemic functional perspective

Despite their differences, the segmental and holistic perspectives on website hierarchy are not irreconcilable. Their most useful insights will be drawn upon and their shortcomings overcome by reconceptualizing website hierarchy through the lens of Systemic Functional Theory (SFT), and, more specifically, by adapting to website analysis the notion of hierarchy of Themes borrowed from Systemic Functional Linguistics (SFL).

4.1. Key tenets of Systemic Functional Theory

Initially developed as a social semiotic theory of language by Halliday (1978; 1994) and Halliday and Hasan (1976; 1985) and later extended by Martin (1992), Matthiessen (1995), and Halliday and Matthiessen (1999; 2004), SFT offers a rich framework for studying meaning-making, or communication, as a dynamic social process. In this framework, expression/form is always analyzed in terms of the meanings it realizes, or its function in a given social context. Another central tenet of SFT is that every act of communication both constitutes and is construed by the socio-cultural context in which it occurs, and simultaneously realizes three broad types of meaning that reflect that interdependency:

- **ideational, with experiential and logical subcomponents**, which serves to represent our experience of the world around and inside us and the logical relations between such patterns of experience

- **interpersonal**, which enables the construal of social relationships, attitudes and feelings
- **textual**, whose function is to integrate ideational and interpersonal meanings into units with socially ascribed unity, i.e. texts.

An advantage of SFT for studies of hypermodality is its focus on meaning, which has enabled its principles to be extended beyond language, to the study of images (Kress & van Leeuwen, 2006 [1996]; O'Toole, 1994), sound (van Leeuwen, 1999), and other semiotics, and their interaction in multimodal texts (cf. Baldry & Thibault, 2006; Kress & van Leeuwen, 2001; O'Halloran, 2004; Royce & Bowcher, 2006; Ventola et al., 2004).² Another advantage of SFT is its social semiotic concept of text as “a structure of message or message traces which has a socially ascribed unity” (Hodge & Kress, 1988, p. 6). As this concept implies neither linearity nor finiteness, it has motivated researchers to adapt SFL tools to hypermedia discourse analysis (cf. Baldry & Thibault, 2006; Djonov, 2005; Lemke, 2002).

4.2. Hierarchy of Themes in Systemic Functional Linguistics

Hierarchy of Themes is one of the key tools employed in SF discourse analysis for theorizing textual meaning, more specifically, the scaffolding of information flow in written texts whose construction is characterized by a high level of attention and planning (Martin, 1992, p. 444) – a characteristic these texts share with most websites.

Within the clause, the **Theme** is “the element which serves as the point of departure for the message; it is that with which the clause is concerned” (Halliday, 1994, p. 37); it is what the rest of the clause, the **Rheme**, is about. In the English clause, as illustrated in Table 1, the Theme extends to include the first element carrying experiential meaning, or revealing the subject matter of the clause. This element is called the **topical Theme**. It may be preceded by one or more interpersonal elements (e.g. modal Adjunct, Vocative) which constitute the **interpersonal Theme** of the clause, which may itself be preceded by one or more textual elements (e.g. conjunction or

continuity Adjunct) – the clause’s **textual Theme**, whose function is to connect the clause to ideas presented in preceding clauses (anaphorically) or following ones (cataphorically).

Table 1. An example of different types of Theme in a clause

So	unfortunately	the kitten	died	yesterday.
Theme			Rheme	
textual	interpersonal	topical		

Martin (1992) develops Theme as a resource for explaining how information is packaged beyond the clause and uses the term **hyper-Theme** to signify “an introductory sentence or group of sentences in a paragraph which is established to predict a particular pattern of interaction among [lexical/taxonomic] strings, [cohesive] chains and Theme selection in following sentences” (p. 437). Extending the analogy further, Martin argues that certain elements in a text (e.g. introductory paragraphs, titles, subtitles) may act as **macro-Themes**, signaling what a whole section or the whole text is about by predicting its hyper-Themes. Since a hierarchy of Themes can be extended indefinitely to account for the structure of complex written texts (Martin & Rose, 2003, p. 185), if this analytical tool is adapted to the analysis of websites, it can reflect their expandability. Due to its focus on semantics, or the function/meaning of elements within a textual structure, the tool has also been adapted successfully to the analysis of multimodal texts (Martin, 2002; Thibault, 2001) and verbal relations between anchors and their destination nodes in CD-ROM-based hypermedia (Clarke, 2001).

4.3. Hierarchy of Themes in website structure

As discussed earlier, the homepage functions to offer users an orientation to the website as a whole. It achieves this by including anchors to the website’s main sections in the form of section icons, titles, or icon-and-title combinations. In successful websites, the appearance and arrangement of these anchors on the homepage aid users in predicting the type of information

offered in the sections they lead to as well as the relationships that obtain between these sections. Since they provide access to the website's sections, they point cataphorically to these sections and function similarly to a textual Theme (or an explicit conjunction) in relation to them. When they also disclose each section's subject matter, their role is comparable to that of a topical Theme. Anchors to website sections or parts of them presented on the homepage also function interpersonally. For instance, the availability of surfacing anchors to current news stories and their frequent change on *CBBC Newsround's* homepage emphasize the site's ease-of-use and reliability as a news source, while the presence of anchors to sections for parents and educators suggests that a children's website complies with the ethical and educational norms society imposes on products for children.

Because it is not just the individual anchors themselves but their arrangement on the homepage that reveals what content is available, how it can be accessed, and how it is organized within a website as well as the values and attitudes endorsed by the website, the homepage as a whole can be considered the website's highest-level macro-Theme. As the relation of the homepage to the website is mirrored by that of a main page to its section, the main page of a section can be interpreted as the section's highest level macro-Theme, occupying a level below that of the homepage, the website's highest-level macro-Theme. By analogy, the main pages of subsections can be seen as subsection macro-Themes at a level lower than that of the main page of each subsection's section. The notion of Theme can be extended even further down to the level of the webpage. As Thibault (2001) has shown for the print page, certain elements such as the title or a very salient visual element can be interpreted as the highest level macro-Theme for the page as a multimodal unit, orienting users to the page as a whole. Thus, the relationship between the homepage, the main page of a website's section, the main page of a subsection of that section, and so on, can be modeled as a hierarchy of Themes.

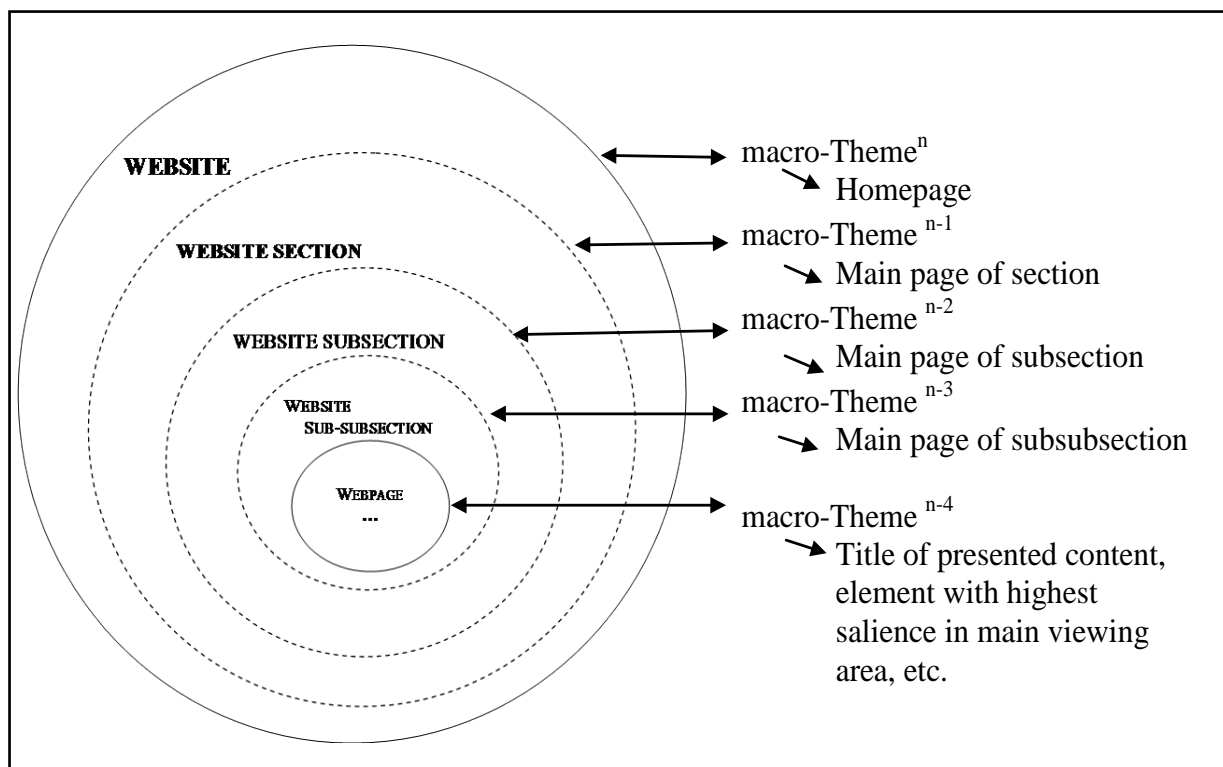


Figure 6. Website structure as a hierarchy of Themes

The interpretation of the relationship between the homepage, (sub)sections main pages and webpage elements as forming a hierarchy of Themes is represented in Figure 6. In it, the symbol ‘...’ stands for ‘webpage areas and items’ and broken-line circles mark optional levels in the hierarchy. ‘Macro-Theme ^[n]’ signifies the highest-level Theme, ‘macro-Theme ^[n-1]’ the one below it, followed by ‘macro-Theme ^[n-2]’, and so on.³ This modeling conveys the idea that website sections can vary in depth, that is, they may or may not have subsections or subsubsections and that a website must consist of at least one webpage.

Concentric circles are employed in Figure 6 to suggest that a hierarchy of Themes in a website operates predominantly on a *scale of containment*. Theme is thus presented as a resource for creating cohesion by packaging information into unified wholes, be they paragraphs, chapters, website sections or whole websites. What that means for websites is that a main page below the level of the homepage can function as a higher-level Theme only to webpages belonging to the same section, subsection, subsubsection, and so on. In other words, the addition of a new section, subsection, subsubsection, and so on gives rise to a separate hierarchy of Themes. Each such

addition is thus interpreted as creating a new sequence of webpages available for users to explore or branch away from to visit webpages in other such sequences. Consequently, a website's structure can be conceptualized as a structure comprising multiple hierarchies of Themes, which are united by the homepage as the website's highest level macro-Theme.⁴ This conceptualization, which defies two-dimensional representation, reflects both the complexity of websites as indefinitely expandable multilinear texts whose many parts can nevertheless display unity and the interdependency between website content organization, navigation and webpage design.

4.4. Hierarchy of Themes in webpage design

Webpage design is the key means for signaling that different (sub)sections or webpages belong to the same website or website section and for revealing a website's hierarchical organization. While separate webpage elements may fulfill the first of these functions, it is their interaction with other elements on the webpage that has the potential to fulfill the second. For example, elements such as the website's logo, masthead or color-scheme may represent the website as a whole, similarly to the homepage. Similarly, a section's icon, title, color, or navigation bar may fulfill the representational function of its main page. As a website is explored primarily one webpage at a time, the individual and combined presence of such elements on every webpage of a website or a website section also helps create continuity across the website's or website section's webpages. By contrast, none of these elements on its own can fulfill the role of the homepage or a section's main page as a high-level Theme that enables users to predict the type or structure of information within a website. Even a telling website logo like "CBBC NR – Your news stories updated every day" offers minimal orientation to the website compared to its homepage.

Powered by various interface design methods, the interaction of these elements with each other, however, increases their power to act as higher-level Themes within a website and allows a webpage to represent the hierarchy of Themes formed by the homepage and the main page of the (sub)section to which this webpage belongs. In this way these elements can also clearly signal to users where they are within this hierarchy of Themes. Such signaling, as previously mentioned, is

particularly important when surfacing hyperlinks are used as on the homepage of *NG Kids* represented in Figure 7.



Figure 7. *NG Kids*: homepage ⁵

In the area of the homepage entitled “Features”, several surfacing anchors are presented through a website metaphor, an interface design method which involves representing website components and their relationships as a real-world environment. The metaphor resembles a slide projection in which the anchors (five square images identical in size and behavior) are the slides.

When rolled over, each anchor ‘projects’ an un-cropped version of the image used in it onto the area above the five slides. The title and lead of the feature or section to which the anchor leads also appear next to the projected image. Figures 8, 9, and 10 illustrate this for the three rightmost slides shown in the “Features” area.



Figure 8. *NG Kids*: homepage: slide projection metaphor (1)

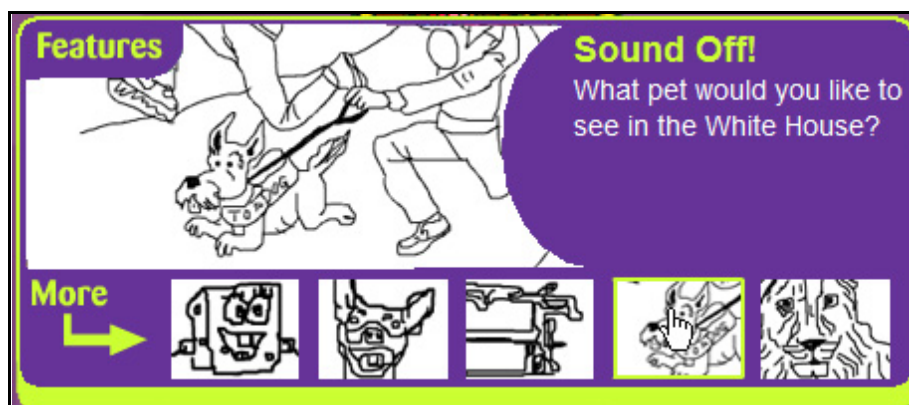


Figure 9. *NG Kids*: homepage: slide projection metaphor (2)

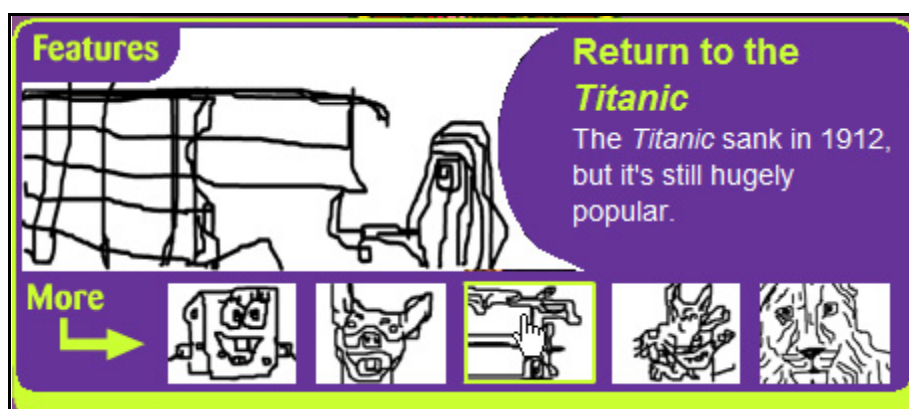


Figure 10. *NG Kids*: homepage: slide projection metaphor (3)

The three ‘slides’ differ in their predicting power. It is clear that the first leads to the main page of “Creature Features” because that section’s title appears on the right of the projected image and

no particular animal species is mentioned in the accompanying lead. This section can also be reached through the “Creature Features” anchor in the vertical navigation bar on the homepage. The slide projection, however, provides more specific information about that section and thus functions as a topical macro-Theme, enabling users to predict that there they can “get animal facts, pictures and more”.

The second slide leads to a feature in the subsection “Sound Off!”, which belongs to the section “NG Kids Magazine”. Whereas the question users must consider in that feature as well as the subsection’s title are shown in the ‘projection’, the section remains unknown until the feature has been visited. On the webpage presenting the feature, the following groups of elements (number-coded in Figure 11) echo the hierarchical organization of the website and thus reveal the website, section and subsection to which the feature belongs (and thereby also the user’s position within the website):

- (1) the website’s masthead with the site’s logo and horizontal navigation bars at the top and bottom of the page, which represent the website and its organization;
- (2) the “NG Kids” section’s logo and horizontal navigation bars, which together with the section’s vertical navigation bar serve as the highest-level macro-Theme for the section; and
- (3) the subsection’s icon and title and the anchor to archived features of “Sound Off!”, all presented on a purple (the section’s color) background.

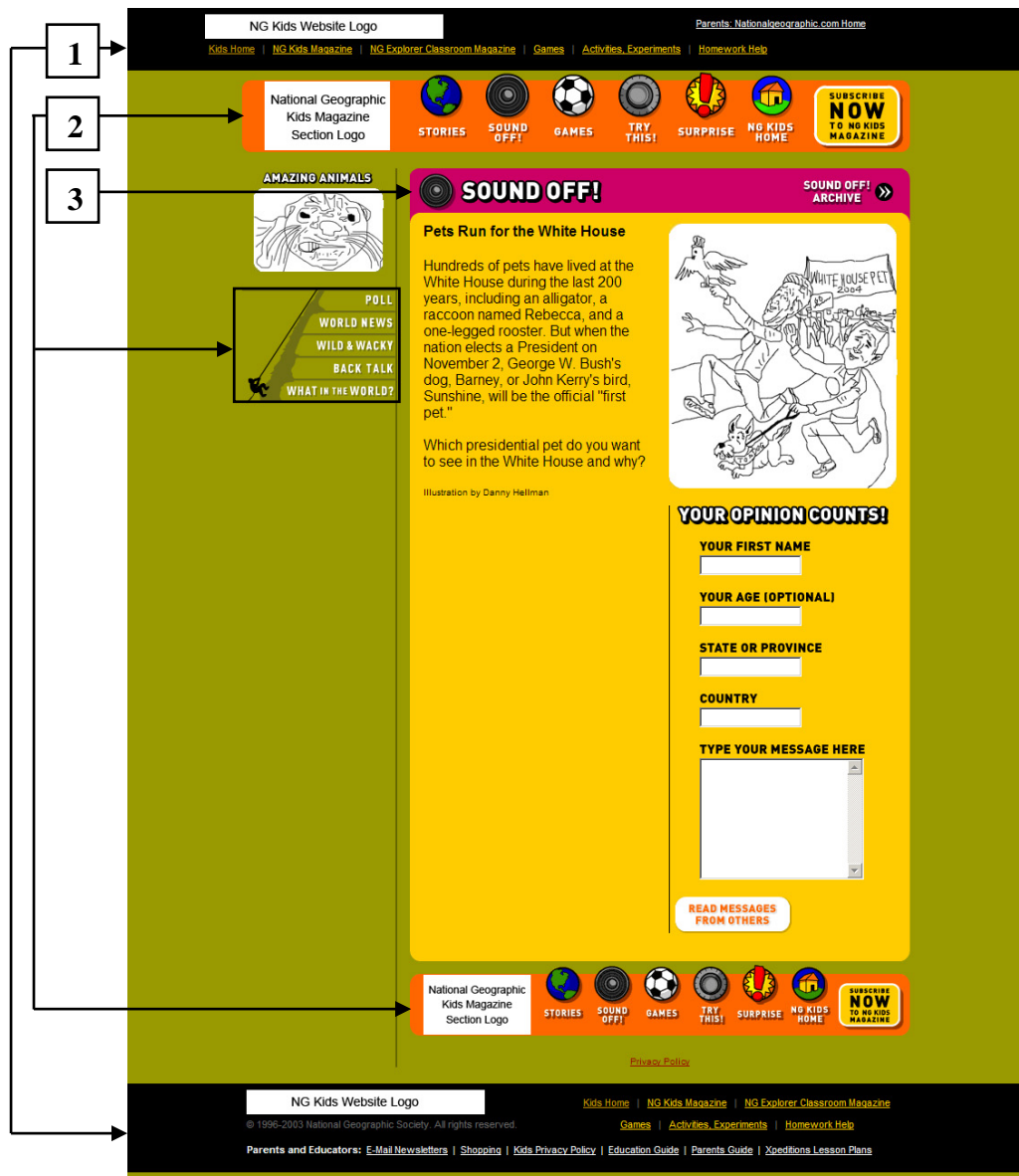


Figure 11. *NG Kids*: “NG Magazine”: “Sound Off!”: “Pets Run for the White House”

The feature accessed through the third slide relies even more on its webpage design to orient users, since neither its section (“National Geographic Explorer”) nor its subsection (“Articles”) appears in the slide projection metaphor. All this information is provided, however, on the webpage presenting the feature, shown in Figure 12, through:

- (1) elements which appear on every *NG Kids* page
- (2) the section’s logo and navigation bar

(3) the subsection's highlighted anchor in that navigation bar, its color-coding in blue (used to frame the article on Titanic) and the title "Featured Article", which appears above the article.

As in the previous example, these three groups of elements reflect the position of the webpage within a hierarchy of Themes and are crucial to user orientation. Although space restrictions do not allow this paper to illustrate this, webpages whose design does not echo the hierarchical organization of their website, by contrast, risk disorienting users.

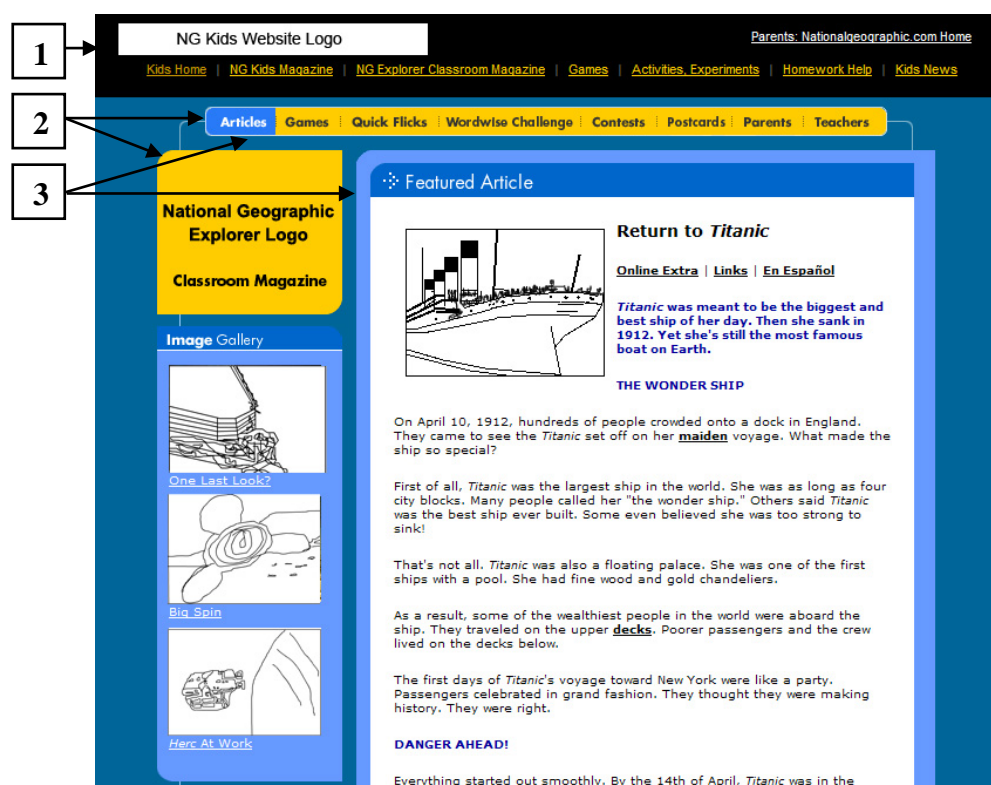


Figure 12. NG Kids: “National Geographic Explorer”: “Articles”: “Return to *Titanic*”

Furthermore, the multimodal co-patterning of webpage design choices allows a webpage to function as a higher level Theme and offer an overview of either the website or one of its (sub)sections, which is more than a mere list of website sections or subsections. For example, a navigation bar can contain section anchors presented using the same typographic style, symmetrical distribution, color and so on, so that users would not just see what sections they can visit and predict from their titles what these sections are about, but also perceive these sections as similar and hence also occupying the same level in the website's hierarchical organization.

4.5. Incorporating content organization and navigation options

Adapting the SF tool of hierarchy of Themes to website structure and webpage design allows us to define website hierarchy in a way that reflects the multilinearity and expandability of websites and the potential of webpage design, through multimodal interaction, to facilitate user orientation. A successful definition of website hierarchy, however, must meet several other criteria, too. First, it must allow linearity to play a role in website content organization. Linearity – *a scale of temporal subordination*, which prevents some webpages from being visited before others – is frequently employed in educational websites or activities to ensure that users progress towards developing certain knowledge and skills by taking the required steps in the most effective order (cf. Fleming, 1998; Lynch & Horton, 1999). Such subordination may obtain within various levels (e.g. website, website section, etc.) in the scale of containment, the dominant scale for organizing website content.

A successful definition of website hierarchy must also explicitly incorporate the notion of different types of website section – surfacing, functional and content sections – and their core or optional status in website design.

Finally, it must reflect the potential of hyperlink traversals to reveal different dimensions of a website's hierarchical organization. While website-external hyperlinks do not have that potential as they transcend a website's structure, the traversal of a website-internal hyperlink between webpages related through subordination (containment and/or temporal) can be interpreted as revealing a website's *vertical* dimension and hyperlinks (including cross-linking ones) between different sections, subsections, subsubsections and so on within the website as revealing its *horizontal* dimension. This interpretation enables the function of surfacing sections to be distinguished from that of surfacing links: whereas surfacing links from, say, the homepage of a website lead to different parts of a website and thus deeper in its hierarchical organization, links from the main pages of surfacing sections typically lead 'sideways' to features in the website's core (usually content) sections, thereby traversing its horizontal dimension. This interpretation

also forms the basis of a more delicate system for defining hyperlink traversals in terms of their direction and the hierarchical dimension of website structure that each reveals, which is proposed in Djonov (2005) as a tool for studying the role of website hierarchy in the interaction between website design and use.

4.6. A systemic functional definition of website hierarchy

Applying the SF tool of hierarchy of Themes to website analysis can help overcome the drawbacks of the segmental and holistic perspectives of website hierarchy, while drawing on their strengths. The preceding discussion has drawn on the holistic perspective's ability to reflect the role webpage design plays in organizing information presented on separate webpages into meaningful semantic units. Considering how hyperlinks may reveal this organization by connecting individual webpages, on the other hand, has utilized the main insight offered by the segmental perspective: that a website is comprised of webpages as its basic building blocks and hyperlinks are the connections between them. Applying the tool of hierarchy of Themes to website analysis has also highlighted the interdependence between website structure, webpage design and navigation and the differential contribution of resources such as surfacing sections and surfacing and cross-linking hyperlinks to website fluidity.

These advantages have inspired the following four-step definition of website hierarchy:

- 1) Website hierarchy is a semantic structure of hierarchies of Themes. These can be represented through webpage design and are unified by the homepage as the website's highest level macro-Theme.
- 2) Each hierarchy of Themes belongs to one of three website section strands (two core, content and functional, and one optional, surfacing) and is based on a scale of containment, within which temporal subordination may also operate.
- 3) The structure has two dimensions: vertical (depth), defined by the number of levels below the homepage in each hierarchy, and horizontal (width/breadth), defined by the number of independent sections in a website or subsections in a section and so on.

- 4) Hyperlinks can transcend a website's hierarchical structure or connect webpages belonging to the same or different hierarchies of Themes within it and thus enable the traversal of both the vertical and the horizontal dimensions of a website, thereby either revealing or obscuring the position of hyperlinked webpages in the website hierarchy.

5. Implications for the design and analysis of websites and their use

The systemic functional definition of website hierarchy developed in this paper brings out the complexity of the organization of information in websites as fluid hypermedia texts: their multilinearity; the fact that website sections may differ in both breadth and depth; the use of containment as dominant and temporal subordination as auxiliary principle for organizing information in website design; the presence of different types of website sections and their core or optional status; the importance of webpage design and its multimodality in echoing a website's hierarchical organization and thereby aiding user orientation; and the potential of hyperlinks to transcend, reveal or obscure a website's hierarchical structure.

Through its focus on the interaction between a website's content organization, webpage and navigation design, the definition also incorporates the strengths of and reconciles the differences between existing understandings of website hierarchy. It thus represents a step towards the development of a metalanguage that can be shared by those involved in the design, evaluation and maintenance of websites as well as by discourse analysts and hypermedia literacy experts.

The aim of reflecting the interaction between content organization, webpage and navigation design was motivated by the desire to redefine website hierarchy in such a way as to make it a useful tool for developing solutions to the central challenge of hypermedia design on the Web – user orientation. As a result, the definition is a suitable basis for designing additional tools for investigating the interaction between website design and use, as demonstrated in Djonov (2005).

The advantages mentioned above can be attributed to the transdisciplinary approach adopted in reconceptualizing website hierarchy from a SF perspective. In this approach, insights from

different areas within the professional field of website design and evaluation are brought together and reinterpreted through the lens of a meaning-based theory of communication as a dynamic social process. It is hoped that these advantages will inspire future studies to adopt a similar approach in developing tools for hypermedia discourse analysis that will complement the definition of website hierarchy developed in this paper.

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Notes

1. Please note that both *CBBC Newsround* and *NG Kids* have been redesigned since the screen captures used in this paper were taken. The current versions of these websites rely considerably more on dynamic elements such as sound, scrolling words, and rollovers, and are therefore less suitable for a print publication.
2. See Kaltenbacher (2004) for an overview of systemic functional multimodal discourse analysis research.
3. Only the term macro-Theme has been used in this model because it is only possible to specify which elements function as hyper-Themes once the elements functioning as Themes have been identified.
4. Norton and Moss mention that a website can be viewed as “an interconnected system of hierarchies” (1997, p. 19), but leave this idea unexplored.
5. As permission to reproduce some types of visual content from *NG Kids* could not be obtained, in all screen captures from *NG Kids*, advertisements are replaced by blank spaces, photographs and drawings by sketches, and logos by verbal labels.

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