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An Evaluation of the World Wide Web Compared to Other Hypermedia systems: Hyper-G and Microcosm

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Abstract

This paper presents an evaluation of the aspects that have made the World Wide Web the most popular distributed hypermedia system. It describes and compares the Web with its contemporaries, Hyper-G and Microcosm. Furthermore, this paper presents a brief history of the hypertext, as well as the architecture of the aforementioned systems and, the factors that drive the web to become a more successful information system than Hyper-G and Microcosm were also explained. Moreover, it proposes the recent development of the Web.

Keywords: *The Web, Hyper-G, Microcosm, Open Hypermedia.*

Introduction

Hypertext systems have been evolved through multiple stages; before Tim Berners-Lee invented the distributed hypertext system, called the 'World Wide Web (WWW)', there were two open hypermedia systems, which are known as Hyper-G and Microcosm. These two systems are not used as widely compared to the Web, which currently is the most used hypertext systems in history. In this regard, the discussion this report, will be divided into five sections; the first section presents a brief history of hypertext development, then, the second section describes the architecture of the Web and the open hypermedia systems. The third section provides a comparative evaluation between the Web and the other two open hypermedia systems. The, fourth section investigates the reasons behind the success of the Web. Finally, the last section analyses the recent web technologies and explores the future of hypermedia system.

A brief history of hypertext

The idea of Hypertext was introduced in 1945, when a theoretical proto-hypertext system called 'Memex' was introduced by Bush in his article entitled "As We May Think" in the Atlantic Monthly magazine [7]. This system comprised of a device that enables its users to organize their information. Twenty years later, the oN-Line System (NLS) was implemented by Doug Engelbart, and in 1965, Ted Nelson invented the word 'hypertext' [16], prior to inventing a hypertext project called 'Xanadu'. Xanadu was the first hypertext project, which sadly was never implemented [16]. Consequently, in 1967, the Hypertext Editing System became the first hypertext system implemented [14]. Then, the first hypermedia system, the Aspen Movie Map system, was developed by Andrew Lippman which opened the door to the growth of the hypermedia community and the development of various hypermedia systems such as NoteCards, Intermedia, Hyper-G, Microcosm and the Web [16].

Architecture of the web

The World Wide Web was invented in the mid of 1989 by Tim Berners-Lee at the CERN laboratory in Switzerland [16]. It was originally developed for sharing information between scientists over the internet. In this regard, the architecture of the Web is based on a client-server model, which primarily consists of three principles; identification, interaction, and data formats. The first principle, identification, refers to where the resources on the Web are identified by Uniform Resource Identifiers (URIs). The second principle is interaction, which refers to the communication between the client and server by using protocols, such as HTTP and FTP. The last one is data formats, such as HTML, which enables the resources to be used by other client sides [5].

Architecture of open hypermedia systems

Davis et al. (1992) defined the Open Hypermedia Systems (OHSs) as "a system in which it is easy to add new functionality." (p. 6) In this regard, these systems are responsible in separating the links from resources which

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enable them to store the resources in different formats in third party programs. Moreover, a past study shown that these systems have better efficiency in managing complex linking operations than the Web [12]. Two of the most significant open hypermedia systems are Hyper-G and Microcosm, which will be discussed below:

Hyper-G

The Hyper-G project was developed by researchers at the Graz University of Technology, Austria, in 1989 [15]. It was specifically developed as an advanced system that supports multi-users, multi-protocols and large-scale information systems [3]. Moreover, it was designed as a second generation of distributed hypermedia systems that can be used to solve numerous problems like “lost in hyperspace" that occur in large-scale hypermedia systems [2, 4]. The architecture of this system was based on a client-server model, similar to that of the Web. Meanwhile, the protocol used in Hyper-G was (HG-CSP), which stands for (Hyper-G Client-Server Protocol), similar to HTTP in the World Wide Web [2, 3].

Microcosm

In the meantime, prior to the introduction of the web in 1989, a small group of researchers from the School of Computer and Electronic Engineering, University of Southampton, UK, had introduced the 'Microcosm' system which separates the links from the data [8]. This system was initiated as an open hypertext system with dynamic linking features that help to resolve the perceived problems in the other hypertext systems [10]. The architecture of this system was based on a peer-to-peer model [11], unlike the Web and Hyper-G, which were implemented as client-server systems [12].

A comparative evaluation

Each one of these three hypermedia systems have its own benefits and drawbacks as shown in Table 1. These, along with a few aspects will be discussed in the proceeding sections.

Table 1: A Comparative Evaluation of the Three Hypermedia Systems

	The Web	Hyper-G	Microcosm
Architecture	Client-server	Client-server	Peer-to-peer
Linking Model	Uni-directional	Bi-directional	Bi-directional
Data Representation	HTML	HTF	No
Search Engine	Yes	Yes	Yes
License	Free	Commercialised	Commercialised
open-source	Yes	No	No
Scalability	Yes	No	No
Simplicity	Yes	No	No

Linking Model

The linking model in the Web is uni-directional and non-contextual links, which are stored inside documents [12]. As a result, the links could be easily broken, and it is impossible to create several links to a document. On the other hand, both Hyper-G and Microcosm supported bi-directional links which are stored in a separate database [2, 8, 10]. Thus, the missing or bad links can be updated automatically by OHSs. At the same time, Microcosm used generic links which reduce the authoring work required [9]. Thus, it can be concluded that the OHSs link model is better than the Web.

Data Representation

The Web and Hyper-G used their own data format to represent the data compared to Microcosm, which did not have a mark-up language. In this regard, The Hypertext Markup Language (HTML) data format is used in the Web while Hyper-G used the Hyper Text Format (HTF) [4, 12].

Searching

The search engines used in Hyper-G was different from the Web and Microcosm. In this light, unlike the WWW, Hyper-G was built with a search engine. Consequently, the proposed search engines for Hyper- G can save any attributes or full text in the Hyper-G database. In contrast, the searching capability in the Web is implemented by third party programs, such as Goggle and Bring. Therefore, the navigation in Hyper-G is deemed as simpler than the Web [17].

The reasons behind the success of the web

After investigating the architecture of those hypertext systems and understanding the comparison between them in the previous sections, it is clear that the Web has considerable numbers of benefits as seen in Table 1 compared to Hyper-G and Microcosm. Due to these advantages, the Web has become the most popular hypertext systems in history. In addition, the Web can be used for free and is simple and open-sourced, which enables anyone to use it without any constraints. As a result, resources in the web has significantly increasing due to the freedom it brings to its users. This has made the Web more valuable, despite the fact that Hyper-G and Microcosm were more commercialized [1]. In addition, the open hypermedia systems (i.e. Hyper-G and Microcosm) were less scalable than the Web. Another reason for this popularity of the Web compared to the other two hypermedia system is its simplicity where it enables its users to deal with without doing much effort in training [6].

The future of hypermedia development on the web

On the other hand, despite the popularity of the Web, it has some weaknesses compared to other open hypermedia systems. One of these limitations is the bidirectional links and limitation of HTML. However, some web technologies have been developed recently to deal with these weaknesses to make the Web more valuable in the future. One of these significant development is the 'Semantic Web', which enables the data to be reused and read by machines [18]. Semantic Web has developed technologies such as XML, OWL and RDF to address some issues on the Web. In this light, despite the limitation of HTML, the Semantic Web provides XML language which is designed to perform advanced functionality on the Web. In addition, to achieve the integration on the Web, some XML based languages such as XPointer, XBase and XLinking [19] can be used. Moreover, another recent development in the Web is the new version of HTTP, HTTP 2, which addresses some problems in HTTP1.1 [13].

Conclusion

In conclusion, even though the Web has its weakness, it is still the most used hypertext system in the internet, as opposed to Hyper-G and Microcosm, which had disappeared and deemed as obsolete. In this light, this report has evaluated the architecture of these hypermedia systems as well as analysed the reasons behind the success of the Web. Moreover, it suggests that Semantic Web as the future of the Web, that is used the semantic linking to connect the data with the Web.

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