

Professional approaches to the World Wide Web in Norwegian education

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Abstract

The World Wide Web technology was developed in the early 1990s. Since then, the web has had a great impact on society.

This paper focuses on the task of creating web sites, but opposes the public image of the practitioner as a teenage whiz kid learning the skills in front of the computer screen in his or her bedroom.

Norwegian web firms are employing persons with very different backgrounds, but most require higher education. Computer professionals and graphic designers are established in the field, but a new occupational group called “information architect” is emerging.

The paper explores how the task of creating web sites is interpreted in Norwegian educational institutions in 1999 and 2000. In Norway, professional higher education is located in the university colleges. Established study programmes in computer science, graphic arts engineering, visual communication, and library and information science are included in the study. Emerging private courses using terms like “web design” and “webmaster” are also included.

The empirical material is analysed using Andrew Abbott's theory of the system of professions. The central term in Abbott's theory is jurisdiction, which means the link between an occupation and its work. Each profession is bound to a set of tasks by ties of jurisdiction. Web technology is viewed as an external disturbance to the system of professions, opening new task areas of jurisdiction.

According to the theory, established professions and new groups contest for achieving jurisdiction over the new tasks. In this case, the established professions are computer professions, graphic professions and information professions. New groups are web designers and webmasters.

A conclusion is that established professions are taking over the field, diagnosing the problem of creating web sites as a new version of their already secure jurisdiction. Five different diagnoses are identified in the university colleges, linked to very different abstract knowledge systems being taught, as can be seen in the curricula at the colleges.

The web design studies have no common body of knowledge, while the webmaster studies are too coupled with web technology per se to be regarded as new professions.

Introduction

The World Wide Web technology was developed by Tim Berners-Lee at CERN in 1989, and introduced on the Internet in the early 1990s. The technology aimed at supporting easy information sharing, distribution and access among the CERN researchers, using computers running different operating systems (Berners-Lee & Fischetti 2000).

Since then, the World Wide Web has had a great impact on society, and its use has expanded way beyond the research communities where it was first adopted. The widespread use of the World Wide Web has changed the way we work, and lots of people are working in occupations that did not even exist ten years ago. During the rise of the “new economy” in the late 1990s, a lot of myths surrounded the web. Mass media created an image of people working in the web industry as teenage whiz kids learning their skills in front of a computer screen in their bedrooms. Either you understood the “language of the web” or you were left behind.

After the web industry cracked a couple of years ago, we can now study the World Wide Web and its impact on society in a more sober way. This paper's perspective is to view the World Wide Web as a disturbance to the system of professions, as described by Andrew Abbott (1988). The technology has opened new task areas for professional jurisdiction, and a new problem to be solved by professionals: *creating web sites*. These tasks are not objectively given. Jurisdictional contest among professions follows the emergence of new tasks. Sometimes a new profession arises to hold jurisdiction over the new task. When the new tasks are created by technology, this is not the normal outcome. Instead, the new jurisdictions are taken by existing professions. A profession with a high level of abstraction in its body of knowledge has an advantage, being able to redefine the new task as a new version of its already secure jurisdiction. Balance is re-established by jurisdictional settlements.

Many new job titles are used in the web industry, like web designer, webmaster, information architect, information designer, interaction designer, and usability engineer. Heated debates between practitioners from different professional backgrounds on discussion forums and Usenet groups suggest that there is yet no stable jurisdictional settlement between the groups. Based on a literature survey, I have earlier divided the public web discourse into three phases defined by professional dominance in the field (Dahl 2001). In the early days of the web, computer professionals created most web sites. Graphic designers took over the jurisdiction from 1996, when David Siegel's influential and best-selling book about web design was published (Siegel 1997). Siegel argues that creating web sites is a new version of the more general concept graphic design, and his sharp rhetoric is also a direct attack on computer professionals. His argument

convinced public opinion, and the web was styled up accordingly. The third phase starts in 2000 when Jakob Nielsen publishes his equally influential and controversial book about web usability and information architecture (Nielsen 2000). He changes the focus to usability, navigation and organising information, playing down the visual component of a web site. Many web sites are redesigned following his advice. Nielsen's background is from the HCI (human-computer interaction) field, usually sorted as a speciality in the computer science discipline. Rosenfeld and Morville (1998), authors of another book about information architecture, have a library and information science (LIS) background and take a similar approach to the web.

These disputes are in no way settled and graphic designers and information architects regularly clash, as humorously summed up at the A List Apart web magazine (Cloninger 2000).

Andreas Øwre (2000) has studied the Norwegian web industry from 1994 to 2000. He concludes that in the early days the practitioners were mostly generalists involved in all stages of web site development. This phase gave birth to the term “web designer”. He claims that the industry became professionalized toward the year 2000, meaning that specialists in technology, graphic design and information/content replace the generalist. These professionals develop their skills and methods in collaboration in the workplace. This represents the jurisdictional settlement Abbott (1988) calls division of labour, which is often unstable and hard to maintain.

In this paper, I choose to view education as the main arena for developing professional skills and knowledge, and where professions' interpretations of the technology are expressed. Even though Abbott (1988) argues that the theoretical professional education is irrelevant to professional practice, it is still important to establish jurisdiction in public opinion. I have studied different study programmes in Norwegian educational institutions relevant to creating web sites.

Established professional education in computer science, graphic arts engineering, visual communication, and library and information science; and emerging web design and webmaster study programmes are included in the study.

In Abbott's (1988) theory, professional practice has three parts: Diagnosis, inference and treatment. In the diagnosis phase, the profession interprets the problem according to its subjective terms. Typically, only the information relevant to the profession's view of the world is taken into account, i.e. some information is lost during the process. The profession reconstructs the problem to suit its established knowledge system, which is being taught in its education.

Using this theoretical framework, I will analyse the material identifying diagnoses to the problem in the professional education, and looking for a common body of knowledge in the new web-focused studies.

To give an introduction to the discourse, I'll first briefly describe the basic technology and introduce the major concepts. These are important to understand the distinctions in the different curricula. Then I'll go through my empirical material from Norwegian educational institution in 1999 and 2000.

A note about the use of the term profession in this paper

This paper uses the term “profession” about occupational groups educated to and working in the fields of computer systems, graphic design and librarianship. Some may dispute the claim that these groups are professions, as the word has been used in sociology. For instance, Olaisen (1988) prefers to call librarians in Scandinavia a semi-profession, rather than a profession, because they lack a common research-based body of knowledge.

I will not use a strict definition of professions, but follow Abbott's loose use of the term. My area of interest is close to Abbott's case study of the information professions (Abbott 1988, pp. 215–246), and my use of the concept follows this.

The web technology

The main components of the World Wide Web technology are the markup language HTML (HyperText Markup Language) and the protocol HTTP (HyperText Transfer Protocol). In technological terms, what happens when we access the web, is that a *client* sends an HTTP *request* to a *server*, and the server sends an HTTP *response* back to the client, normally including an HTML document. The HTTP protocol defines the rules for the communication between the client and the server.

Translating to daily speech, the client is typically a *web browser*, like Microsoft Internet Explorer (the blue *e*-icon on the Windows desktop), Netscape, Mozilla or Opera. More generally, the client can be any tool running a software application that knows how to speak HTTP and can display HTML documents in a pleasing way to the user. These days, mobile phones, PDAs and TVs are also able to access and view web content.

The server is a computer connected to the Internet, running a software application known as a *web server*. A web server knows how to speak HTTP, and its job is to wait for HTTP requests from clients, and respond to them accordingly.

The web standards, like HTML and HTTP, are published and maintained by the World Wide Web Consortium (W3C), which is led by Tim Berners-Lee. W3C's goal is to develop open technical specifications securing interoperability and accessibility across technological platforms and cultural differences. (W3C 2000)

Markup languages

HTML is a *markup language* created in *SGML* (Standard Generalized Markup Language). SGML defines syntax to create markup languages, one of which is HTML. A markup language describes the structure of documents, enabling computers to read and process their content. SGML was developed at IBM in the 1970s, and became an ISO (International Standards Organization) standard for document exchange in 1986 (ISO 8879).

HTML is the first successful SGML language. The SGML standard was too complex and general to reach large audiences, and few user-friendly tools were available. HTML is a small markup language with an easy syntax, supporting hypertext links to other resources on the web. This is one of the reasons why the web had such an enormous growth in the late 1990s. The technology was so easy to use that anyone could set up a web server and publish HTML documents to large audiences.

Separating content and semantics from presentation is a major goal in HTML, like other markup languages. The web standard supporting this is called Cascading Style Sheets (CSS). A style sheet is linked to the HTML document specifying colours, fonts and other layout properties.

W3C has also created a more general markup language, XML (Extensible Markup Language). XML is a lightweight version of SGML, but utilised for the World Wide Web with support for hypertext links. XML languages with acronyms like RDF, SOAP, and WDSL will be important building blocks in the World Wide Web Consortium's vision of a semantic web (Berners-Lee & Fischetti 2000).

Server-side programming

In the early days of the web, most web sites served only static web content, i.e. static HTML documents. Today, most web sites serve dynamic content. The techniques used are commonly called server-side programming, which means writing computer programs that extend a web server's capabilities. The web server forwards client requests for dynamic web pages to the computer program, which produces HTML output that is sent back to the client. These technologies are used to create web interfaces to legacy databases and applications, or serving web content stored in databases.

Client-side programming

There are also ways to extend the capabilities of the browser beyond presenting HTML pages. These techniques are called client-side programming. HTML, program code and data are sent to the client over the web, and the browser can process the program without contacting the web server.

JavaScript is the most widely used client-side scripting language on the web. The language can make the web interface more functional than HTML alone and is also often used to create visual effects. Due to incompatibilities in different web browsers, JavaScript has been standardised by ECMA, the European Association for Standardizing Information and Communication Systems (ECMA 1999). The standardised version is called ECMAScript.

The other major technique is Flash, a multimedia format used to create animations that can also include sound. Tools from the software company Macromedia must be used to create Flash animations. To view the animations, a plug-in application must be installed in the browser. The plug-in is included by default in most browser software.

The survey

The research is based on 11 study programmes at 8 different Norwegian education institutions in 1999 and 2000. I chose to include established professional study programmes related to the three dimensions associated with creating web sites, also identified by Øwre (2000): technology, graphic design; and content/information. In addition, I picked out different study programmes called web design and webmaster. For each study programme, I analysed the curriculum and conducted an interview with one person responsible for setting up the curriculum.

A more thorough description of the survey can be found in Dahl (2001).

Professional higher education in Norway

In Norway, professional higher education is located at the universities and the university colleges. The six study programmes included in the survey are listed below.

- The bachelor programme in computer science at Østfold University College
- The bachelor programme in graphical engineering at Gjøvik University College
- The two-year programme in data and multimedia at Gjøvik University College
- The two-year programme in visual communication for electronic and printed media at Buskerud University College
- The master programme in library and information science at Oslo University College
- The master programme in media and communication at the University of Oslo

I have identified five different diagnoses to the problem of creating web sites in these study programmes. These are discussed in detail below.

Computer systems

The computer science study programme at Østfold University College diagnoses the problem as a new case of developing computer systems. The same design methods are used as when developing traditional computer systems. No major changes have been made to the basic curriculum as a response to the event of the web technology. Naturally, many graduates will find a job developing web sites, as most computer systems these days run in a web environment. This change has happened recently, so the lack of changes can either be interpreted as a slow reaction to changes, or as a deep confidence in the profession's established jurisdiction. Possible contestants for the tasks in this jurisdiction could be the new occupational groups called webmasters or web designers.

In the USA, the Computer Society of the Institute for Electrical and Electronic Engineers and the Association for Computing Machinery have joined forces for nearly 40 years to develop guidelines for defining the main body of knowledge being taught in undergraduate programmes in computer science. Their latest report was published in 2001 (The Joint Task Force on Computing Curricula 2001), about a year after the data collection for my project. The report points out that the appearance of the World Wide Web has been a dramatic change to the discipline and on society as a whole. Different curricular topics have increased importance, including The World Wide Web and its applications, networking technologies, graphics and multimedia; and HCI. At the same time, the new topics are hard to include in the study programmes:

“As these topics increase in prominence, it is tempting to include them as undergraduate requirements. Unfortunately, the restrictions of most degree programs make it difficult to add new topics without taking others away” (The Joint Task Force on Computing Curricula 2001, p. 10)

At the Østfold university college, different web related topics, like client- and server-side programming in the web environment and markup languages were covered among the courses that students could choose from when I conducted my study. Today, Web development is one of three routes that students can follow, and a course in web programming is also included in the more general Programming route.

In addition, a course in visual design for the web has been introduced that is now a mandatory part of the Web development route. This includes topics typically covered by graphic design or visual communication studies, like typography, colours and graphic tools in the web environment. I find this course an anomaly in a computer professional's education, and I

interpret it as an admission that the profession's normal treatment isn't sufficient when creating web sites.

Multimedia

Another diagnosis to the problem is to view the web as a *multimedia* environment. In this way, the web is a natural expansion from CD-ROMs and computer games production. In my material, two of the study programmes use this diagnosis.

The two-year programme in data and multimedia at the Gjøvik university college is very technically oriented, treating the problem of creating web sites with mathematics and programming rather than artistic skills. Server-side programming is one of the topics being covered. This kind of study programme graduates practitioners to the computer profession. As Abbott (1988) points out, the “computer profession” is loosely organised with a high degree of vertical differentiation. In practice, system analysts or designers are closest to an effective professional jurisdiction, with programmers as a subordinate group. The system analysts talk to the clients and diagnose the problem, using methods from their knowledge system to design the computer system in an abstract way. The actual implementation of the system—the treatment—is carried out by the subordinate programmers. The graduates from this study programme learn tools and techniques for treating the problem of creating web sites, but lack the high level of abstraction necessary to compete for the highest rank inside the computer profession.

On the other hand, the media and communication study programme at the University of Oslo also has a multimedia diagnosis, but applies a very abstract knowledge system during inference. The World Wide Web is sorted under the term *new media*, alongside computer games and other multimedia products. New media has been part of the education since about 1990. The study programme is part of The Faculty of Arts, where analytical academic skills are preferred to applied practice. Considering these graduates as a profession, their education has a very abstract knowledge system, but offers no treatment to the problem. Still, candidates from this study programme are actually very prolific in the Norwegian web industry, where they have occupational titles as information architects (Dahl 2001).

Knowledge organisation

The study programme in library and information science diagnoses the problem of creating web sites as a new version of *knowledge organisation*. Andrew Abbott (1988) shows in his thorough historical case study of the information professions how American librarianship has developed through history, from a profession close to the library as an institution, to advanced information retrieval and indexing techniques. Thus, the discipline at academic institutions is now called

library and information science (LIS). The Norwegian Library School was established in 1940, and—following the development in English-speaking countries—has included information in its name since 1990 (Henriksen 1990).

Viewing the World Wide Web as a collection of documents in need for structuring and organising, the task of creating web sites falls into the librarians' established jurisdiction. The curriculum now includes web-related topics like markup languages (HTML and XML), server-side programming, digital documents and information architecture. LIS is no unified academic discipline, and only students choosing the knowledge organisation route in the master programme will take part in all these specialisation courses. After finishing their master theses, the students receive the restricted title *civil librarian* that was accepted by the Norwegian Ministry of Education and Research in 1999.

Librarians have defined their jurisdiction in several ways through history, but access to information is the main way to legitimise their work today. Librarians structure material in the library to support information retrieval for users. Typical tasks falling in to their work domain include indexing, classification and reference work, studies of users' information seeking behaviour, and developing databases and algorithms for information retrieval. As Abbott (1988) points out, librarianship—like many other information professions—has been threatened by technological development. In the librarians' case, new tools like the microfilm (in the 1930s) and the computer represent commodification of their professional knowledge. Librarians, however, have adopted these tools and become the experts at using them, ending up with an increased number of tasks where they can use their professional knowledge.

Following the librarians' history, the World Wide Web can be viewed both as a threat and an opportunity to extend their jurisdiction. Many have argued that search engines like Google are replacing the librarians' reference services, and librarians defend their jurisdiction using arguments concerning the relevance, quality and credibility of the documents Google serve their users. Louis Rosenfeld and Peter Morville, authors of the influential book “Information Architecture for the World Wide Web” (1998), have their education and experience from the LIS field, and are offering some comforting thoughts for librarians afraid of losing their job:

Many librarians have responded slowly to new information technologies like the Web. Some librarians feel that their value as professionals will be diminished as “virtual libraries” supplant those filled with physical books and periodicals. Many librarians fear that the public will bypass them and go directly to the source via the Internet. The truth is, however, that skills in information organization and access are more and more necessary in this era of information explosion. We have

found that the demand for our skills in classifying and organizing information in web sites has grown beyond our wildest dreams, so we believe that you, your sites, and their users will benefit from our profession's perspective. (Rosenfeld & Morville 1998, p. xiv)

Some of these ideas have been taken up at the Norwegian master study programme in library and information science. Still, librarians have not been able to claim their jurisdiction over the information architecture area in public opinion or in the relevant workplaces like the large web firms. These jobs are occupied by graduates from media and communication studies as mentioned earlier.

Cross publishing

The graphic engineers offer a fourth diagnosis to the new problem: *cross publishing*. In this view, the World Wide Web is a new medium where the content in structured documents and databases can be published. The graphic engineers' established jurisdiction is in printed media, where their work includes pre-print, printing and production. The main argument is that the *production processes* in digital media, like the World Wide Web, is similar to printed media. Reducing the problem to a new version of their established jurisdiction, the problem of creating web sites is a natural extension. They offer a treatment consisting of markup languages, multimedia databases and user interfaces. Graphic engineers will solve the problem for their clients by keeping a single source of the content, typically set in a markup language or stored in a database, and being able to publish it in different print and digital formats, like CD-ROMs or web documents.

The graphic production industry has also been threatened by technological development. Until the early 1980s, they had a monopoly over the tools and skills. Laser printers; and word processing and desktop publishing software have commodified these skills, enabling clients to typeset and print their own documents. According to a report from the association of graphical firms in Norway, the profession was too passive when this happened, and is now sketching out an offensive strategy to redefine their profession as an important actor in digital media production (Grafiske Bedrifter Landsforeningen 1993). The development of the graphic engineer education at Gjøvik University College is important in this strategy, and in 2001 a master programme was established.

The graphic engineer represents the need for what the report calls *processors* in the industry. On the other hand, there's also a need for *creators*. The two-year programme in visual communication for electronic and printed media at Buskerud University College takes care of these needs.

Visual communication

The last diagnosis for the problem among the university colleges is *visual communication*, as can be found at Buskerud University College. The study programme has recently been established, as part of the strategy by the association of graphical firms. Like the cross publishing diagnosis, the common properties in printed and digital media are emphasised. This study programme is close to traditional graphic design, concentrating on arts and aesthetics, typography, communication and branding. To enter, the students must solve a creative problem where they demonstrate their artistic skills.

The visual communicators hold the jurisdiction of design in printed media, like magazines, newspapers, advertising and book covers. Creating web sites is reduced to a new form of graphic design; communication and advertising.

In the interview at the school, I noticed a very hostile attitude toward engineers and programmers. The respondent maintained that computer professions are involved in creating web sites only temporary. Their knowledge will eventually be commodified in tools, and visual communication will be the surviving skills in the field. In Abbott's (1988) words, this means a settlement giving the visual communicators full jurisdiction.

Conclusion

The different professional study programmes in Norway have responded to the World Wide Web technology by adding new web-related topics to the curricula. The topics are put into different contexts, melting into each profession's established body of knowledge. Abstract knowledge systems make the professions able to diagnose the problem of creating web sites as a new version of their already established jurisdiction.

Emerging specialised web courses

Web designers and webmasters are new job titles to emerge directly coupled with the event of the World Wide Web. Some university colleges have introduced new programmes (like Gjøvik and Buskerud), but most are taught in private institutions. The following are included in my survey:

- Web design
 - Merkantilt institutt, ½ year
 - IT-akademiet, 1 year
 - IKT-skolen SIKT, 2 years

- Webmaster
 - IT-akademiet, 1 year
 - IKT-skolen SIKT, 2 years

Web design

The three web design studies in my material vary in length and content. One is a half-year course, one lasts a year with evening lectures, and one lasts two years.

The half-year study is design-oriented, but teaching tools and techniques supporting the work of creating web sites (Adobe Photoshop, Adobe ImageReady, Adobe GoLive, preparing and compressing images) instead of the basic body of knowledge in graphic design. Documented design skills or formal training are required to enter. Many students are accordingly visual communicators (graphic designers) with skills and experience in printed media, taking their competence to the web. Using Abbott's (1988) terms, this study programme only offers treatment methods. The diagnosis to the problem of creating web sites is visual communication.

The evening study programme, on the other hand, has a technical understanding of the web. The web design course is part of a webmaster study being taught at the same school, which means that a web designer is a lightweight webmaster. The education is coupled with certification in three different topics: Internet and the web (networking, web servers and security among other things), graphic and design (actually an Adobe Photoshop certification); and site designer. The curriculum is based on tools (for instance Macromedia Dreamweaver and Microsoft FrontPage), suggesting that skills in markup languages (HTML) are considered commodified. Focusing on tools also means a low level of abstraction. Accordingly, the curriculum has to be updated continually.

The longest study programme diagnoses the problem of creating web sites as visual communication, and has much in common with the university college study programme at Buskerud University College. According to the respondent, the body of knowledge in visual communication is timeless and abstract with roots thousands of years back. The World Wide Web is just a new medium for applying these skills. Contrary to the other two web design studies, this has a strong theoretical basis. The main architect behind the curriculum had a background from graphic design and book printing. In the interview, he opposed the way most graphic designers treat the web medium. They don't understand what separates the web from printed media. Instead, the curriculum takes an industrial design approach to the medium. Accordingly, the unique properties, possibilities and limitations in the web medium are emphasised in the topics being taught, and Jakob Nielsen's (2000) usability principles are central.

To sum up, the three web design study programmes in my survey do not have much in common.

Webmaster

According to the O'Reilly book "Webmaster in a nutshell" (Spainhour & Eckstein 1999), a webmaster deals with the technical aspects of a web site. A webmaster is responsible for the performance of the web server and helping writers and editors to publish their documents, with the overall goal to serve the web site's content to the users in a credible and trustworthy way.

The two webmaster studies in my material have roughly the same understanding of the concept. One is a one-year study, the other lasts two years. The one-year study includes the half-year web designer curriculum, as mentioned in the previous subchapter. Server-side programming and databases are additional topics.

In the two-year study, the curriculum is also technically oriented, with additional topics in visual communication. In many ways, it has a lot in common with ordinary computer systems study programmes, with topics like programming, operative systems, databases, system development and project management. In addition, web-centred topics like web server administration and server side programming are covered.

Inferring from my data material, a webmaster education is easier to define than a web designer education. Still, it is hard to single out a unique body of knowledge. The content of the curriculum has too much in common with the more established general computer study programmes, the only difference being the title. Another problem is that a webmaster's skills are too coupled with web technology *per se*, suggesting a low level of abstraction making the professional tasks vulnerable to technological change (Abbott 1988). My prediction is that the webmaster title will be used in organisations, but the practitioners will belong to the already vertical differentiated computer professions. Webmasters will typically belong to the lowest levels in the profession.

Conclusion

In this paper I have viewed the World Wide Web as a disturbance to the system of professions, as described by Andrew Abbott (1988). The technology has opened new task areas for professional jurisdiction. The new tasks are not objectively given, but the technology is open to interpretation by different professions.

According to the theory, a disturbance to the system is followed by jurisdictional contest ending with re-establishing the balance when the professions' agree on some kind of jurisdictional settlement. Andreas Øwre's study of the Norwegian web business from 1994 to 2000 (Øwre

2000) suggests that some kind of settlement by division of labour has been reached (in this case between computer scientists, visual communicators; and information professionals). This kind of settlement is considered unstable and difficult to maintain (Abbott 1988).

I view education as an arena for professional contests. In their education, the future practitioners are introduced to their profession's body of knowledge, and which tasks are parts of their jurisdiction. I have identified five different diagnoses to the problem of creating web sites in professional education in Norway:

- Computer systems
- Multimedia
- Knowledge organisation
- Cross-publishing
- Visual communication

These ways to classify the problem make the professions able to extend their established jurisdiction to include creating web sites. Some have very strong abstract knowledge systems used during inference, while others offer direct treatment.

The term web design is a controversial term, and my study concludes that it has no common definition in Norwegian education. This supports Øvre's (2000) view that web designers are generalists, with no common body of knowledge.

The webmaster study programmes, on the other hand, emphasise the technical aspects of a web site. However, a webmaster's skills are hardly unique. It's reasonable to expect that web technology will be a central ingredient in computer science curriculum, as indicated by the report from The Joint Task Force on Computing Curricula (2001) in the USA.

Changes to the system of professions do not happen overnight. In my view, there seems to be an agreement that computer professional have jurisdiction over the professional tasks of server side programming and building the technological infrastructure for web sites. These skills have become more important recently, as many organisations create web interfaces to legacy databases and applications.

Still, there are two areas where there seems to be ongoing arguments and differing opinions:

1. Are HTML and markup languages commodified knowledge?

From my material, it seems that the shorter study programmes and those close to visual communication view the actual HTML markup of web pages as commodified in tools. One

respondent viewed the web technology and the tools in their infancy, and predicted that in some years' time the web publishing tools will have the same capabilities as desktop publishing software today. David Siegel has the same view (Siegel 1997). Some even argue in favour of dropping HTML altogether, replacing it with user interfaces made entirely by Macromedia Flash. Many oppose this view, asserting that semantic markup is essential, and that a WYSIWYG¹ editor is useless when creating web pages. The pages will always look different on different screens and tools connected to the Internet. Therefore, some study programmes teach hand-coding documents in HTML and XML, like the graphical engineering and library and information science education.

2. Analogies for the web user interface.

In my opinion, there is still no jurisdictional settlement about the task of creating the web user interface. While traditional software applications have highly standardised user interfaces, the web site aims at emphasising brand identity and an appealing individuality. Several analogies are offered by the diagnoses I've identified. The visual designers emphasise artistic skills and the common properties of printed and digital media, and industrial design is another perspective. The librarians view the World Wide Web as a large library of documents, and are offering their knowledge in organising and structuring information in the library as a treatment to the problem. Rosenfeld & Morville (1998) have the same approach. Computer scientists offer their HCI approach to the problem, which means usability testing and interfaces supporting human cognition.

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¹ WYSIWYG is a commonly used acronym for What You See Is What You Get, meaning that what can be seen on the computer screen is exactly the same as what is printed out on paper

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