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# Web-based Systems Development: The Influence of Disciplinary Backgrounds on Design Practices

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## Abstract

Web development teams are multidisciplinary, bringing together designers from a variety of backgrounds. A Web designer's professional training and education can shape his problem-solving orientation and world view by indoctrinating certain values and conditioning him to think and behave in certain ways. This paper presents an analysis of data gathered across 14 interviews, wherein four distinct orientations were identified: (1) Web development as the design of a functional software application (emphasis on back-end functionality); (2) as the design of an interactive tool (emphasis on ergonomics); (3) as the design of a communicational dialogue (emphasis on audience engagement); and (4) as an extension of branded graphic design (emphasis on visual presentation).

**Keywords:** Web design approaches, Influence of professional background

## 1. Introduction

The design of Web-based systems calls for such an eclectic set of skills that it is rare for any single individual to be expert in all aspects. In addition to software engineering and programming skills, there are also important roles for information architects and interaction designers/HCI specialists as well as graphic designers, technical writers, brand design/marketing consultants and content producers. Past experiences from Web and interactive multimedia development projects reveal that differences between the professional backgrounds of team members can cause major problems [44, 8]. Kautz & Nørbjerg [23] assert that the move towards multi-disciplinary teams is an observable trend across systems development in general and as such it is not an issue that is specific to Web design. However, it may be argued that the problems which arise from multi-disciplinary interaction appear to be more aggravated in Web-based systems design than elsewhere. This is because, in marked contrast to traditional software development environments, many if not most Web designers come from non-technical backgrounds and have limited knowledge of software design techniques or programming [8]. In particular, visual designers (VD) have an important role to play, and they along with software developers (SD) are the two foremost disciplines in Web design [30]. The relationship between SD and VD has traditionally been characterised by a pronounced tension, verging on mutual disdain. Vertelney et al [45] note that they "appear to operate in distinctly different worlds", and Kim [26] discovered that "each found the other way of thinking incomprehensible". Elsom-Cook [13] outlines the problem as follows:

*"we are taking members of different disciplines and trying to form a coherent operational group out of them ... you must at least understand superficially what each other team member does and the value of their contribution to the overall product. If you are starting from a basis in which the graphic design team is describing the programmers as 'visually illiterate' or the programmers describe the graphics team as 'wishy-washy posers', then you are starting from the wrong place"*

Traditionally, the role of graphic designers has been regarded by software developers with contempt, their brief merely being to “make things look pretty after they are made to work” [45], brought in as “decorators” at the end of the process and instructed: “here is what we have done – make it look nice” [15]. On the other hand, graphic designers typically regard software developers as being rigidly logical and pedantically insistent upon such concerns as “functionalism, modularity and maintainability” [16]; they are “ ‘feature-freaks’ who could care less how a thing looks as long as the code is elegant” [45].

Designers from different professional backgrounds bring their own toolkits of techniques and problem-solving approaches to bear upon a situation. The influence upon the practice of Web-based systems design of various background disciplines such as traditional computer-based systems development, visual design, industrial design, architecture, film production, and publishing has been alluded to in a number of studies [39, 5]. An important question is therefore: how can we fruitfully merge and integrate the legacy of knowledge accumulated across these various disciplines? This in turn requires us to improve our understanding of differences in “thinking styles” between designers from different backgrounds, the ultimate objective being to bring about some degree of resonance between the various beliefs, values and priorities that underpin design methods and problem-solving approaches [26, 22]. Greenbaum & Stuedahl [18] make the point that:

*“Programmers and designers need to work closely with each other, but each professional group has a different identity and a differing understanding of the concept of design ... the characteristics they inscribe into the design can and do give different appearances and functions to the finished web site”*

A number of authors have suggested that it would be interesting to investigate methods and techniques used by Web-based systems designers from backgrounds other than software development. However, this issue has received very little attention thus far. Only a few studies have looked at differences in perspectives between software developers and graphic designers [26, 45, 16], or how graphic design techniques might be applied to software design [2, 11]. In view of this gap in the literature, the objective of this paper is to contribute to a better understanding of how the approaches used by Web designers from different professional disciplines compare to another.

## **2. Contributing disciplines in Web design**

The terms “field”, “discipline”, or simply “area” are often used interchangeably [4]. Within both the software engineering and information systems communities, there have been debates in recent times about academic legitimacy and progression towards disciplinary status. Similar discussions can be found within the literature on graphic design. Much of the argument over whether a particular field is an academic “discipline” or not arises out of conflicting conceptions of what that actually means. There are two main competing viewpoints here:

- 1) A normative definition with an emphasis on rules and procedures, where members of a community adhere to established methodological principles and subscribe to common ontological and epistemological beliefs, akin to a Kuhnian “paradigm”. In this view, the acquisition of a single dominant paradigm is indicative of the maturity of a field, and students qualify for membership of a community by being inducted into the application of accepted norms [28].
- 2) A descriptive definition, not concerned as much with the identification of a common perspective, but rather delineating what topics and practices fall within the boundaries of the discipline, however diverse. Evidence of the existence of a discipline in this sense comes in the form of academic departments, programmes, professorships, dedicated journals, seminal books, and community-based associations.

This paper follows the second of these viewpoints. The term “discipline” is herein loosely defined as a recognised area of professional practice requiring specialised training.

Disciplines do not emerge in isolation; rather, they build upon and adapt knowledge from pre-existing disciplines, so-called “reference disciplines”. Figure 1 shows the various reference disciplines which contribute to the practice of Web-based systems design. To use the language of Wittgenstein [48], two “families” are evident, named here as “software development” and “visual design”. Though both weakly share a number of common influences (e.g. industrial design, cognitive psychology, sociology), it should be noted that these two families are not directly related and as such are foreign to one another.

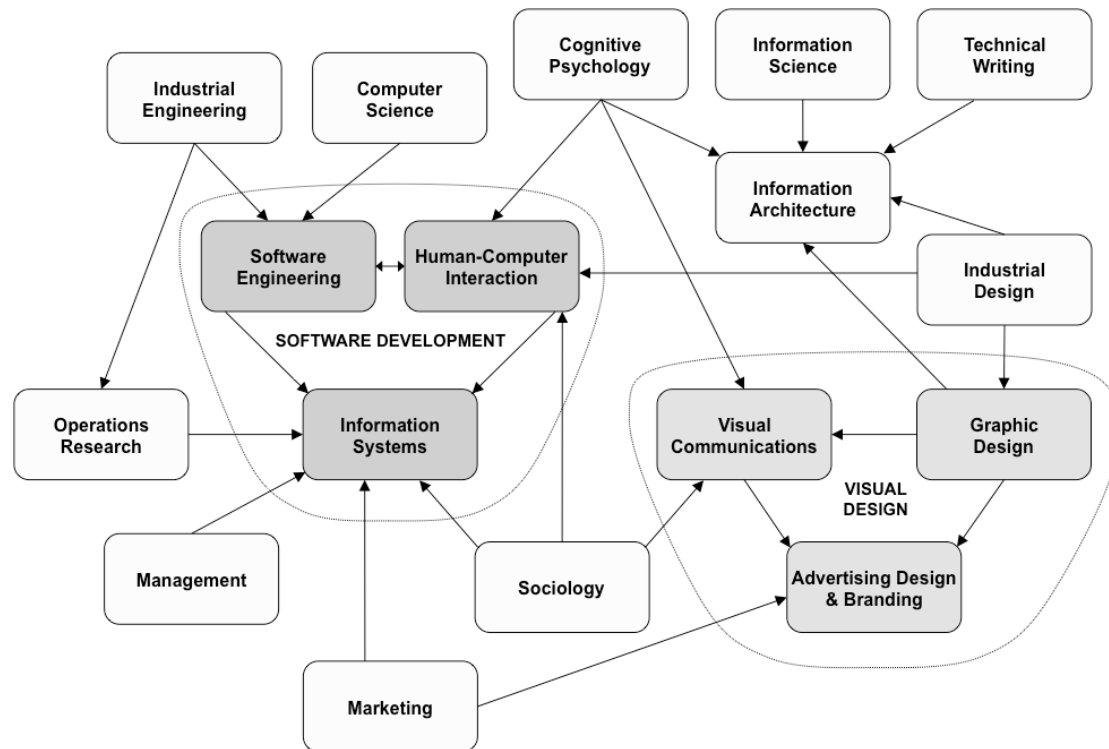


Figure 1. Reference disciplines in Web design

## 2.1. “Software Development”

Notwithstanding their different emphases, the disciplines of Information Systems (IS), Software Engineering (SE), and Human-Computer Interaction (HCI) have a shared focus: the design of computer-based systems. Within this paper, the term “software development” (SD) shall therefore be used to embrace all three.

Though IS, SE and HCI may sometimes quarrel in academia as they stake claims to disputed territory, in practice there is substantial overlap and cross-membership. Although “software development” is an aggregation of a number of related academic fields, which in turn might be argued to consist of further sub-specialisations or schools [20], it shall be assumed for now that in practice these fields are more alike than different when compared to an indirectly related field such as Visual Design. Otherwise put, the fields of IS, SE and HCI as manifest in practice are assumed to be part of a group which, despite their individual differences, bear sufficiently close resemblances to be recognisable as a “family” (i.e. SD), clearly distinguishable from members of other “families” but also visibly related to one another [48]. Mathiassen [34] makes the point that “in practice, there is no clear division of labour between information systems specialists and software engineers and computer specialists”, while Buxton [7] also remarks upon the blurring of roles between systems analysts, programmers, and software engineers. To a considerable extent, graduates of computing programmes, regardless of specific emphasis, ultimately find themselves in the

same job pool seeking employment as an “analyst/programmer”, “software engineer”, “database designer” or such like.

## 2.2. “Visual Design”

In this paper, the generic term “Visual Design” (VD) is used to encompass those related branches of study which have variously been referred to throughout history as “industrial art”, “commercial art”, “advertising design”, “advertising art”, “graphic art”, “graphic design”, “visual communications”, “information design”, “information architecture”, or “visual engineering”. In seeking to comprehend the boundaries, motives, and world view of a discipline, it is useful to reflect upon its historical roots [26]. An early landmark in the history of Visual Design was the establishment of the Bauhaus School of Design in Germany in 1919. Although the early focus was on industrial design standards, the arrival in 1925 of the Hungarian photographer László Moholy-Nagy and the German typographer Herbert Bayer led to visual design becoming a major element of the Bauhaus curriculum [35]. When the Bauhaus was forced to close in 1933 by an oppressive political regime, most of its leaders emigrated to the United States. In 1937, Moholy-Nagy established the School of Design in Chicago (otherwise known as the “New Bauhaus”). A Bauhaus affiliate, Georgy Kepes, became Professor of Visual Design at MIT in 1946 and later went on to found the Center for Advanced Visual Studies in 1964 [37, 38]. Although university programmes in Advertising Design and Industrial Design were in existence in the 1940s, the first programme in Graphic Design in the United States was established at Yale in 1950 [24]. Back in Europe, the Royal College of Art in London created a School of Graphic Design in 1948, and graphic design formed part of the curriculum within thriving Schools of Design at Basel, Zurich, and Ulm. In the 1950s, with the emergence of television and a growing recognition by business of the importance of branding and corporate image, graphic design flourished as a profession and moved beyond typography and advertising design into the more sophisticated arena of “visual communications” [6, 25, 35, 37]. By the 1960s, when software development was only yet in its infancy, the field of Visual Design was firmly established, there existing a number of dedicated journals and manuals of best practice. The central objective of Visual Design is to use visual elements (e.g. colour, images, typography and layout) to effectively and efficiently communicate information; very often, this information is designed and presented with a clear commercial purpose in mind, such as to cultivate brand awareness or to attract and “lure in” a consumer. Thus it should be expected that the approach taken by a typical graphic designer to the development of an e-commerce Web site would be markedly different than that taken by a typical software engineer.

## 3. Problem-Solving Perspective and “World View”

A designer’s professional training and education can shape his problem-solving orientation and world view by indoctrinating certain values and conditioning him to think and behave in certain ways [41]. Kuhn [28] makes the point that “the practitioners of a particular specialty ... [who] have undergone similar educations and professional initiations ... [may] approach the same subject from incompatible viewpoints”. Episkopou [14] defines a “world view” as “a personal framework of interpretation consisting of an individual’s values and assumptions about the world”. Some authors have drawn attention to the framing influence of design techniques on one’s problem-solving approach, claiming that techniques “may cause the analyst or designer to see the world in different ways” [47] or can “blinker the way their users perceive the problem under review” [1]. O’Donovan & Roode [40], following Heidegger, refer to tools and techniques as “equipment”, the devices engaged by members of a discipline to accomplish common goals and interests in accordance with the “orientation of the discipline”. Thus, while the *chosen* techniques can have a framing influence, the initial *choice* of techniques is itself affected by a given predisposition.

O’Donovan & Roode [40] also speak of the “cultural structure of a discipline” which they describe as a “shared intellectual world” comprising “a web of collectively accepted

meanings” and a set of norms, conventions, and customs “which supports and orientates practices in the discipline”. A number of scholars have focused on shared values as the central feature and distinguishing characteristic of a discipline’s culture [19, 42]. Kim [26] asserts that:

*“disciplines are like cultures: for disciplines to work well together they must learn to appreciate one another’s language, traditions, and values ... Different disciplines have different priorities, different thinking styles, different values. When people from different disciplines get together, their values collide. What one person finds valuable others do not even notice.”*

One’s values and priorities affect how one makes judgements and generally behaves [27]. Indeed, they can affect the choice of design methods [10, 21]. It is therefore plausible to suggest that a designer’s background discipline might be a factor which affects his design approach, because of the world view, orientation and value system which prevail within that discipline. A better understanding of the differences, if any, between the “world views” of designers from a SD background as compared to a VD background is therefore an important issue in Web-based systems design given the major role played by both groups.

| <b>Organisation</b>                     | <b>Interviewee job title</b> | <b>Interviewee background</b> | <b>Interviewee experience (years)</b> |
|---|------------------------------|-------------------------------|---------------------------------------|
| <b><i>Software Development (SD)</i></b> |                              |                               |                                       |
| Bizweb                                  | MIS Applications Architect   | Software development          | > 10                                  |
| DigiCrew                                | Internet Software Engineer   | Computer games development    | 10                                    |
| JobsPortal                              | Web Project Manager          | Software development          | 5                                     |
| OEG                                     | Chief Web Technologist       | Software development          | 9                                     |
| IBUS                                    | Managing Director            | Software development / HCI    | 10                                    |
| W3M                                     | Managing Director            | Applied physics & electronics | 15                                    |
| <b><i>Visual Design (VD)</i></b>        |                              |                               |                                       |
| Clearscape                              | Director /Senior Designer    | Graphic design                | 7                                     |
| KL Design                               | Managing Director            | Fine art / Graphic design     | 12                                    |
| Martech                                 | Creative Director            | Fine art / Graphic design     | 9                                     |
| Redmoon                                 | Managing Director            | Media / Visual communications | > 10                                  |
| <b><i>Industrial Design</i></b>         |                              |                               |                                       |
| BroadCorp                               | Web Project Manager          | Industrial design             | 6                                     |
| Strata                                  | Creative Director            | Industrial design             | 10                                    |
| <b><i>Miscellaneous</i></b>             |                              |                               |                                       |
| Bizweb                                  | Managing Director            | Business studies              | 8                                     |
| Bizweb                                  | QA Manager                   | Industrial engineering        | > 10                                  |
| Webcorp                                 | Commercial Director          | Business studies              | 10                                    |
| OEG                                     | Web Editor                   | Physics / Web development     | 10                                    |

Table 1. Profile of interviewees

#### 4. Research Method

To investigate the potential influence of professional background on Web design practices, a field study consisting of semi-structured qualitative interviews with 14 Web designers/developers was conducted (see Table 1). Interviewees were purposefully selected so as to have a range of different professional backgrounds in order to facilitate comparative

analysis. Six interviewees were from fields that fall under the general banner of Software Development (SD), four were from backgrounds that are classified under Visual Design (VD), two were from Industrial Design backgrounds (closely related to VD), and the remainder were from various other areas such as business studies, physics/electronics or industrial engineering.

Many of the interviewees had recently won or been nominated for awards at prestigious national ceremonies. It was assumed that award winners would be more forthcoming, knowledgeable and insightful, and also that they exemplify best practice. In most of the organisations visited, one personal interview was conducted with the team leader, typically convened during the mid-day break so as not to encroach upon busy work schedules. In one organisation two developers were separately interviewed, and in another the managing director brought five staff members into the meeting room. Where available, secondary data sources were also consulted. Data gathering continued until a point of reasonable “theoretical saturation” was reached. The data was analysed using a hybrid method, mainly based on the procedures of grounded theory [17, 33, 43], but also informed by the principles laid down by Miles & Huberman [36].

## 5. Findings and Analysis

An argument that one often encounters in the literature is that Web-based design is a fundamentally new area, warranting methods and techniques different from those traditionally used in “conventional” software development and other reference disciplines. To investigate this, interviewees were asked to reflect on their initial move into the field of Web-based design and to think about what they carried forward from previous fields they had worked in, what needed adaptation, and what was altogether new. Interestingly, even though the range of interviewees’ background disciplines was quite diverse, they all felt that the design approaches they had previously used in other fields mapped across to Web design quite well with some minor adaptations, and the various perspectives were more alike than different. Common to all were an emphasis on simplicity, user-centredness, value added, and fitness for essential purpose. However, some subtle but notable orientations in approach were also identified which may be classified into four separate perspectives explained as follows.

### 5.1. Web development as the design of a functional software application

A number of interviewees had backgrounds in, as one of them called it, “old school software development”. Notably, they all regarded Web-based systems development as just another class of software development for which all the established norms and conventions still hold.

The Chief Web Technologist at OEG, who began his career in the early 1990s developing transaction processing systems with 3GL programming languages, was of the opinion that the “whole classical process, in terms of project delivery and definition through to delivery, has essentially remained unchanged”, and that by and large the methods and techniques that are used in the design of a Web-based system are the very same as traditional software development. Though the programming environment and systems architecture are more complex, he regarded these as mere “syntax” issues which do not have any profound affect on the choice of systems development approach followed. Similarly, the Project Manager of JobsPortal explained that their process is “*very* traditional, it’s the same”. He also expressed a view that Web-based systems development until recently was considerably less challenging than traditional applications development, but it now qualifies as “proper” programming so the same rigorous programming methods as of old are necessary.

As regards orientation and priorities, the interviewees from traditional software development backgrounds generally regard Web design as the construction of a *functional application*. Their primary emphasis is on programming rather than GUI or interaction design. One confessed that he normally is “itching to get into coding” while another explained that “my natural instinct is of a developer, I think in terms of functionality and don’t care as much about the look-and-feel”.

## 5.2. Web development as the design of an interactive work tool

The perspective of interviewees whose backgrounds are in industrial design or HCI treats Web development as the purposeful design of an *interactive tool* to help people achieve their desired ends as efficiently as possible. As mentioned by both the Web Project Manager at BroadCorp and the Creative Director of Strata, an education in industrial design conditions one to be continually alert for potential user interaction problems and to seek out ever more “quick and inventive ways of enabling users access information”. The priority of those from industrial design/HCI backgrounds is to enable users to execute tasks quickly by virtue of well-designed easy-to-use means. As the Managing Director of IBUS keenly emphasised, “the way you design something can really impact the quality of someone’s daily working life”, so for e-commerce Web sites the implication is that well-designed systems stand a better chance of attracting and retaining users. “Design” in this sense refers to interaction design, as opposed to graphic design, though the two are of course closely related. This distinction and corresponding order of priorities is exemplified by the following excerpt:

*“What I really don’t like, because it interferes with the Web site design process, is someone who has a purely creative flair and no idea of how a user will end up using something. When we do user tests on Web sites like Revenue or motortax.ie where people have a task to do, if you ask them afterwards what colour the Web site was, they often won’t be able to tell you! Webs like that need to be very user-focused. Sure, it needs to look good and the form needs to reflect motor tax and all that usual kind of brief, but I don’t think you need to worry about ‘should it a curvy line across the top?’ or the style of button. Yes, branding is important, but I think some designers focus too much on the branding and the identity, whereas for me the [interaction] process is a lot more important.” (Creative Director, Strata)*

## 5.3. Web development as the design of a directed communicational dialogue

An interesting perspective on Web design was provided by the Managing Director of Redmoon; this interviewee had over 30 years experience in various branches of media studies, including film-making, magazine editorials, and corporate communications. Redmoon was founded in the US in the early 1990s, but it is now a virtual organisation with employees based at various locations in Ireland and Greece. Though they develop functional database-driven e-commerce systems, the lead actors in the company are from professions such as film-making, advertising design, and sound engineering. This fusion of backgrounds has given rise to a design process going by the motto of “focus-branded-interactive”. As the Managing Director explained,

*“People tend to fumble a lot around what information needs to be there and how it’s best presented. So design has been devalued to a dressing up thing, but there’s no inherent connection between any of it ... The first thing we do in our creative thinking process is sit down and listen very closely to what the client is telling us about themselves. ‘Well, we do this, we do that, ...’, so what I’m listening for is points of interactivity. Whereas they’re sitting there thinking ‘I just want a flat Web site that has information etc.’, they don’t realise that in fact what we’re trying to do is take a way of interacting with their clients, not only putting it on the Web but maybe even enhancing it.” (Managing Director, Redmoon)*

This approach is informed by the Managing Director’s background as a film-maker and writer, because it is the “concept” and not the content that is the most essential element of a production. As he elaborated, “just like a movie or a book, it must start with a consideration of *Why?*”, so they start the design process by seeking to develop an understanding of the quintessential attributes which epitomise the client organisation:

*“Take the example of somebody who thinks they’re in the supermarket business, but really they’re not. They’re in the trust business or comfort business but don’t realise it, because that’s actually what people are buying. So coming to an understanding with*



*the client about what it is that they're really about helps us to have a core to evolve a production. And then we can begin to thrash things out and see what things might look like and what communication channels we can open up.” (Managing Director, Redmoon)*

This perspective on the Web as a visual communications medium sees the objective of design as the purposeful direction of an interactive dialogue between the system and its captive audience. It should be acknowledged that while such an outlook may sound rather novel to most software designers, it is not altogether original because the applicability of the metaphor of film and theatrical narrative to interactive systems design has previously been commented upon by Webb [46] and Laurel [31].

#### **5.4. Web development as an extension of branded graphic design**

Another perspective on Web development treats it as being simply an extension of traditional graphic design. As the Creative Director of Martech explained, the brief for a graphic design project is usually a marketing requirement to do with the visual presentation of a client's products/services offering:

*“They're looking for you to take their core whatever-it-is, interpret it from an objective viewpoint, 'boil it down', and then re-present it in a way that is visually appealing and more easily accessible by the general public.” (Creative Director, Martech)*

The objective of graphic design is to effectively communicate a message visually. To achieve this goal, issues such as attractiveness, legibility, accessibility, usability, and clarity are important, which in turn require the appropriate application of fundamental design principles regarding visual aesthetics, balance, equilibrium, and the use of colour, fonts, and visual elements. Like the “communicational dialogue” perspective explained in the previous section, the intention of graphic design is to attract users and then lure them to “come on in!” (i.e. the so-called “stickiness” factor):

*“People don't read a Web site the way they might read a book, they skim through things, so you have to think: 'what's the first thing they are going to see?' ... If people are looking for a specific piece of information, will they be able to find that easily just by looking at the front page? Is there enough information on the front page and is it attractive enough to actually get people to look at more of the site?” (Managing Director, KL Design)*

Regardless of medium, be it a black-and-white flier, a billboard advertisement, or the design of a Web site, graphic designers have always faced technical limitations. As such, they are accustomed to having to devise creative ways of achieving their desired ends as best possible within the inherent constraints imposed by a particular medium. The environment of Web design, – with the limitations that it imposes on the use of “safe” fonts and colours, visual display space, download times and so forth, – presents just one more hurdle to which graphic designers must again apply their practical problem-solving skills. At Clearscape, the Senior Designer described how traditional techniques from graphic design readily transfer across to the Web. For example, modular grid systems such as used in type-setting are helpful in designing Web sites so that they are “loose enough to allow the site to grow, and tight enough to maintain visual and structural integrity”. With regard to project management and elaboration of the requirements, Web design is not regarded by graphic designers as being fundamentally new, but just an extension of their traditional practices:

*“A project is a project regardless of whether it's a graphic design project or a Web design project. We would have a lot of projects here that are still solely graphic design based, such as marketing campaigns for new businesses. Sometimes the client might engage us to do the Web site as well and they might ask us to do a stock control database system or whatever as part of one of the services they're engaging us for.*

*From my point of view, that is just another element of the project, I treat it or feel no differently about it.” (Creative Director, Martech)*

That said, there is much greater variation and unpredictability in this mode of delivery than previous media (e.g. the fixed-size formats of static print and linear video, compared to variable-size Web screens with dynamic visual components). This has critical implications for the shape and focus of development processes. Continuing with the explanation of Martech’s Creative Director:

*“Our technical director brought more to the table from his IT background in arriving at a design process than I would have, simply because of the different ways of things. My experience in graphic design was very much the concept of the ‘art director’ who is overseeing a project. A brief for a graphic design project is usually a lot more cut and dried. It doesn’t have the testing aspects that a software project would have, which is a fundamental difference. The ultimate test, of course, is the client’s opinion and how it performs in the marketplace, but the production process is a lot easier to manage simply because it’s visual. It’s easy for an art director to assess how work is progressing because you don’t need to sit down for 2 hours and go through it and test modules and so on. So when our technical director was talking about our processes, it was very clear to him what an ideal scenario should be, and over the years we have successfully implemented that.” (Creative Director, Martech)*

Though this excerpt highlights fundamental differences between software development (SD) and visual design (VD), an interesting finding of this research project is that there is much common ground. Contrary to popular belief, both disciplines aim to speed up production through extensive *re-use* of existing components, which at first sight may seem to fly in the face of a graphic designer’s remit to be “creative” and “original”. Efficiency, usability, elegance/simplicity, and maintainability are also parallel concerns, as again illustrated by the words of the Creative Director at Martech:

*“As somebody who has a foot in either camp, I really respond to what I would consider to be ‘quality programming’, like a ‘beautiful’ piece of code. It would be more that it was cleanly written and that it did what it was meant to do in a very efficient way and didn’t sap resources unnecessarily. I would feel the same way about a [graphic] design, that it should be efficient at communicating what it needs to.” (Creative Director, Martech)*

## 6. Conclusions

This paper set out with the premise that the professional background of a Web designer may influence his problem-solving perspective and sense of priorities. Based on a qualitative grounded analysis of data gathered across 14 semi-structured interviews, four distinct orientations were identified: (1) Web development as the design of a functional software application (emphasis on back-end functionality); (2) as the design of an interactive tool (emphasis on ergonomics); (3) as the design of a communicational dialogue (emphasis on audience engagement); and (4) as an extension of branded graphic design (emphasis on visual presentation). Although this analysis is based on a limited sample, the findings are revealing in that they cast some illumination on an intriguing area which as yet is poorly understood and remains to be explored in depth i.e. how problem-solving approaches drawn from the fields of graphic design and visual communications may usefully complement and extend “traditional” IS development methods.

Kumar & Bjørn-Andersen [29] recommend that curricula for teaching, training, and socialising systems designers should be re-designed “to introduce them to design issues and choices other than those with which they are currently familiar”. Even yet, a criticism that can be made of many higher-level educational programmes, – be they in software development, visual design, or other area related to Web-based systems development, – is that they produce graduates whose skill sets and problem-solving perspectives are rather narrow. Web design

educators should aim to cultivate a transdisciplinary perspective, thereby enabling graduates to approach problems from a variety of viewpoints. Such an enriching change in perspective would potentially be akin to a Kuhnian “revolution” for Web-based systems analysis and design as we know it:

*“During revolutions scientists see new and different things when looking with familiar instruments in places they have looked before. It is rather as if the professional community had been suddenly transported to another planet where familiar objects are seen in a different light and are joined by unfamiliar ones as well” [28].*

What many employers in the Web design industry desire are holistic cross-disciplinary programmes with a suitably proportioned blend of IT/technical, systems analysis and design, graphic design, HCI, and business/marketing skills. As one interviewee put it, *“we don’t want people to be expert in all the various aspects of Web design, but we do want them to have at least a basic understanding of what those aspects entail and how they all fit together”*. Much can be gained by reaching out to the various reference disciplines that contribute to Web-based systems design and defining an integrated body of core knowledge. Checkland [9] makes the argument that:

*“What we need is not interdisciplinary teams but transdisciplinary concepts, concepts which serve to unify knowledge by being applicable in areas which cut across the trenches which mark traditional academic boundaries”*

For example, as was remarked by an interviewee, essential principles of design such as “beauty” and “aesthetics” are universal, relevant not just to graphic design but also to other aspects such as software design. Though there exists a substantial body of literature on design theory, – the common ground for various branches of design such as architecture, graphic design, engineering design, and industrial design, – the field of Web design and more generally software design is notable by its extended absence from such journals as *Design Studies* and *Design Issues*. A number of authors have mentioned how, for example, architectural design might serve as a useful reference point for information systems development or software engineering [3, 12, 32]. However, the fundamentals of general design theory rarely appear on syllabii for systems analysis and design courses, nor do they explicitly feature in the IS2002 curriculum or SWEBOK. I therefore conclude with a recommendation that the rather narrow and insular perspective of traditional systems analysis and design courses, as exemplified by the predictable structure and content of standard textbooks, should be overhauled and extended to expose students to design perspectives and alternative world views drawn from the other disciplines which have come alongside us into the cosmopolitan “brave new world” of Web-based systems design.

## 7. Further Work

This paper is one of a series produced as the outcome of the author’s doctoral dissertation. For related work, including quantitative survey results, see references [30, 49-52].

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