



ISSN: 1545-679X

# Information Systems Education Journal

Volume 6, Number 19

<http://isedj.org/6/19/>

February 21, 2008

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## The Design Charrette in the Classroom as a Method for Outcomes-based Action Learning in IS Design

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**Keywords:** design, design charrette, action learning, outcomes-based action learning, pedagogy

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**Recommended Citation:** Eagen, Ngwenyama, and Prescod (2008). The Design Charrette in the Classroom as a Method for Outcomes-based Action Learning in IS Design. *Information Systems Education Journal*, 6 (19). <http://isedj.org/6/19/>. ISSN: 1545-679X. (Also appears in *The Proceedings of ISECON 2006*: §3733. ISSN: 1542-7382.)

This issue is on the Internet at <http://isedj.org/6/19/>

The **Information Systems Education Journal** (ISEDJ) is a peer-reviewed academic journal published by the Education Special Interest Group (EDSIG) of the Association of Information Technology Professionals (AITP, Chicago, Illinois). • ISSN: 1545-679X. • First issue: 8 Sep 2003. • Title: Information Systems Education Journal. Variants: IS Education Journal; ISEDJ. • Physical format: online. • Publishing frequency: irregular; as each article is approved, it is published immediately and constitutes a complete separate issue of the current volume. • Single issue price: free. • Subscription address: [subscribe@isedj.org](mailto:subscribe@isedj.org). • Subscription price: free. • Electronic access: <http://isedj.org/> • Contact person: Don Colton ([editor@isedj.org](mailto:editor@isedj.org))

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# The Design Charrette in the Classroom as a Method for Outcomes-based Action Learning in IS Design

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## ABSTRACT

This paper explores the adaptation of a traditional studio technique in architecture – the Design Charrette – to the teaching of New Media design in a large information systems program. The Design Charrette is an intense, collaborative session in which a group of designers drafts a solution to a design problem in a time critical environment. The Design Charrette offers learning opportunities in a very condensed period that are difficult to achieve in the classroom by other means and we have adapted its application from the architecture studio to for New Media instruction. The teaching of information systems has tended to rely heavily on conventional pedagogical approaches although there is growing recognition of the importance of experiential and applied learning. Accreditation standards have also placed added emphasis on outcome-based learning and encouraged more mindfulness concerning instructional design (Lee et. al., 1995; McGourty et. al., 1999). As a consequence, more emphasis on experiential learning has emerged in recent years. Architecture has long been used as a reference discipline for Information Systems and much of the language used in information systems design is drawn from architectural discourse. However, while architectural design combines attention to history and form as well as function, most information systems design is driven by functional considerations. Teaching New Media design, like architecture, demands attention to the conceptual and aesthetic as well as the functional design perspectives and presents particular challenges. The Design Charrette, a short but intense effort to solve an architectural problem is an outcome focused form of action learning that has enormous potential to enrich the teaching of New Media design, in particular, and information systems in general.

**Keywords:** design, design charrette, action learning, outcomes-based action learning, pedagogy

## 1. INTRODUCTION

This paper explores the adaptation of a studio learning approach – the Design Charrette – to the teaching of multi media design in a large information systems program. The Design Charrette is an intense, collaborative session in which a group of designers drafts a solution to a design problem in a time

critical environment. The Design Charrette offers learning opportunities in a very condensed period that are difficult to achieve in the classroom by other means and we have adapted its application from the architecture studio to for New Media instruction.

New Media is taught from a number of disciplinary perspectives: courses are found in

art, communications, architecture, instructional design and computer science programs. New media as a discipline is not considered part of the mainstream of traditional computer science curricula. In the Steelman Report of ACM SIGCSE's Curricula 2001, digital media does not figure as a "core topic" in computer science (Wong, et. al. 2003) nor is it core to the IS model curriculum (Al-Rawi, 2004). Nevertheless, many IS programs do have courses in New Media which vary in their emphasis on technical versus aesthetic aspects. While some focus purely on the technical aspects, perhaps with some attention to usability, other courses attempt to introduce other design elements including the effective use of colour, image and sound (Wong et. al. 2003).

Although in the past, aesthetics has received little attention, particularly in technology and systems-oriented programs, recent research suggests that the visual aesthetics of computer interfaces are a strong determinant of users' satisfaction and pleasure. (Kurosu and Kashimura, 1995; Tractinsky, 1997; Tractinsky et al., 2000, Lindgaard and Dudek, 2002 ) and specifically in the context of the web (Schenkman and Jonsson, 2000; van der Heijden, 2003). While classical notions of aesthetics emphasize orderly and clear design and are related to many of the design rules advocated by usability experts, the "expressive" aesthetics dimension is manifest in the designers' creativity and originality and by the ability to transcend design conventions (Lavie and Tractinsky, 2004). Effective New Media design must address aesthetics as well as functional elements but aesthetics presents particular challenges.

Measuring the performance of students in a design course is difficult since New Media design generally requires mastery and integration of a wide range of tools (Wiedenbeck and Henninger, 2000), is a collaborative process (Lawson, 1997) and includes a certain amount of creativity which can only be evaluated subjectively (Shiratuddin, 2001). While teaching the tools is relatively straight forward, teaching "good design" has never been.

At Ryerson University in Toronto, there is a New Media stream in the image arts program (along side photography and film production) as well as in the Bachelor of Commerce (Bcom) in Information Technology

Management (ITM). While there are common elements in the two programs the orientations are very different. In the BCom in Information Technology Management, the digital media specialization builds on a solid core of technology and management courses including programming and systems analysis and design. The ITM 445, New Media in Business course introduces students to the application, production, and implementation of New Media in business. Building on the students' basic skills in HTML, the course addresses the principles of New Media design as well as a range of hands on applications (Macromedia Studio, Premiere, Photoshop) The theory portion covers the fundamentals of New Media production such as graphics, video, audio and text, New Media applications in business, and issues in the management of New Media such as usability, design and distribution. (ITM, 2005) Students work individually and by the end of the course students are expected to develop a personal portfolio web site. The course is a foundation of the digital media specialization in the BCom in ITM. In spite of this, the projects produced by the student groups have been very strong and some have been implemented by "clients".

Ensuring students have a strong grasp of the principles of design as well as the tools to develop websites is a challenge in 13 weeks of classes. In architecture studios, the Design Charrette is often used as an experiential teaching and learning opportunity and in the Winter of 2006, this technique was adapted to the New Media course.

## 2. LITERATURE REVIEW

### Action Learning

Action learning, it could be argued, has emerged at least in part from the notion of action research, pioneered by Kurt Lewin (1947, 1948). Lewin sought ways to foster collaborative learning among experts and clients by employing an iterative procedure with a sequence of planning-acting-observing-reflecting. Donald Schön (1982) examined how professionals really go about problem solving and concluded that "reflection-in-action" was an iterative, collaborative process, combining both art and science. He proposed redefining relationships between clients and professionals, teachers and stu-

dents into collaborative rather than expert/non-expert relationships.

In the studio, problems are set for the students that are 'ill defined, uncertain or incoherent'. Schön maintained that the fundamental concepts of designing could only be through the experience of designing. He maintained that "reflection in action" was the basis of any design process. "Knowing in action" is tacit and spontaneous, professional knowledge that can't be learnt from a book, nor described with much success. It is a dynamic knowledge, whereas facts, rules, procedures and theories are static. Knowing in action consists of strategies of action, understanding of phenomena and ways of framing the problematic situations encountered in day-to-day experience. Reflection in action is the questioning and challenging associated with problematic situations in practice — a reflective dialogue with the designer's own knowing in action. Schön believed that this kind of tacit knowledge inherent in designing could only be learnt in the unique environment of the studio. In the studio, there are ideally regular consultations between student and master designer (tutor). It is through demonstration of, and reflection upon their own knowing in action that the master conveys this tacit knowledge to the student. Through speaking and demonstrating (e.g., drawing) in tandem, the teacher demonstrates how to explore and act (Broadfoot and Bennett, 2003).

Revans (1982a; 1982b), is credited with defining "action learning" based on his experience working at the Cavendish Laboratory with eight Nobel prize winning physicists who met together to discuss their experiments and learn from each other. His iterative model, successively alternating experience and preparation reflection, is a useful paradigm for active learning. Since then, many others have refined and redefined the approach which is generally understood to refer to "a process of learning and reflection that happens with the support of a group or "set" of colleagues working with problems with the intention of getting things done" (McGill and Beaty, 1995). The participants in the set each take forward an important issue with the support of other members of the set. The process helps people to take an active and responsible stance towards learning and helps to overcome the tendency towards passivity in the learning process.

(Brockbank and McGill, 1998, p 218). The key elements of an action learning process include:

- focus on solving a multifaceted, real and often "messy" problem for which there is no single solution
- individuals meeting together in a group (known as a set)
- each individual other than the facilitator brings to the set a real issue/problem or project that they wish to progress
- the aim for each individual presenting their issue is to be able to take action on some aspect of the issue, to reflect upon and learn from the actions as the issue is progressed
- typically, the action learning set meets for three to four hours
- the set will create explicit conditions, 'ground rules' on which to operate to ensure effective working
- the process is iterative, based on reflection, questioning, conjecture and refutation

(Brockbank and McGill, 1998, Weinstein, 1995 and Boddy, 1981 and Smith and O'Neil, 2003, Dilworth, 1998).

Traditionally, the teaching of information systems has tended to rely heavily on conventional pedagogical approaches – "chalk and talk"- although there is growing recognition of the importance of experiential and applied learning. Accreditation standards have placed added emphasis on outcome-based learning and encouraged more mindfulness concerning instructional design (DeLyser and Hamstead, 2000). Outcomes Based Action Learning (OBAL) which emphasizes guided instruction in theory and the application of theory via case studies, design competence labs/workshops and term projects has been promoted in information systems (Ngwenyama and Klein, 1994; Ngwenyama, 1993, Ngwenyama, 1991). It has also been used as a model for specific IS courses including a capstone course (Burns and Janicki, 2003) and project management (McGann and Cahill, 2005) and others.

### 3. ARCHITECTURE AS A REFERENCE DISCIPLINE FOR INFORMATION SYSTEMS

Architecture has long been used as a reference discipline for Information Systems. Much of the language used in information systems design is drawn from architecture. The early 1990's saw the emergence of a new sensitivity to issues to design in information systems (IS). For example, Lee (1990) showed how the discipline of architecture could enrich design in IS. Some have suggested that the "design attitude", a set of expectations and orientations that a designer brings to a project, has relevance also to information systems design (Boland and Callopy, 2004). The basic idea of a Design Attitude holds that a designer (or manager) in designing solutions, should question the fundamental notions of the problem statement, be creative, and pursue higher ideals for the design solution. Design attitude encourages the designer to begin from the perspective that each project is an opportunity for invention through thorough interrogation of the problem and a solution that makes the world better.

Christopher Alexander (1977) reacted to the lack of richness in contemporary design in architecture and identified an historic 'pattern language', defined as a set of problems and their solutions in the design of buildings. Tufte (1990) outlined a set of principles of information design which he argued were universal. Stamey, Honeycutt and Blanchard (2004; 2005) attempt to operationalize general design principles from the work of Christopher Alexander in architecture and the graphic information design principles from Edward Tufte for web design. Winograd's collection on software design (1996) makes strong links and analogies from computing to architecture and vice versa. Halstead-Nussloch and Carpenter (2002) have suggested using Architecture as a model for Human Computer Interface Design.

Architectural design requires a balance between art and science. The buildings must stand – there are certain rules and requirements which must be understood and adhered too. At the same time, architecture values aesthetics. Schön discussed this creative tension in his analysis (Schön, 1988) and suggested that while the architectural design studio is currently an anomaly in uni-

versities, it actually represents an opportunity, a model of "learning-by-doing" which could be adapted in other contexts. He notes:

*The positivist epistemology of practice underlying the modern research university emphasized a retrospective view of science as a body of facts, theories and techniques, which professions like architecture are meant to apply. But when we experience science and architectural designing as before-the-fact inquiries, we become aware of their deep similarities and potentials for reciprocal influence" (Schön, 1988, 10).*

There is a debate in architecture schools between phenomenological and rational modes of thinking and design. Some argue that intuition and reflection, processes critical to imaginative problem solving, are being overshadowed by scientific training which provides only a range of technical and behavioural knowledge, influenced by designers such as Venturi. Others concerned with the rationalisation of architecture, who subscribe to the theories of Christopher Alexander or Herbert A. Simon, argue the case for devising and teaching explicit models of the design process (Proudfoot, 2000).

#### **The Architectural Design Process: The Role of the Studio**

Known as 'ateliers', the studios at the Ecole Des Beaux Arts provided the basis of a pedagogical method that is still the core of design and architectural education. The primary method of teaching architecture was learning by doing with a focus on the design problem. Students were divided into ateliers, and lead by a tutor. Traditions emerged that are still prevalent today— the use of the esquisse (initial sketch solution to a problem that would be further developed), the teaching of design by practicing professionals, the use of the charrette (an intense, collaborative session in which a group of designers drafts a solution to a design problem) and the final evaluation of student work by a jury (Broadfoot and Bennett, 2003).

While schools of architecture place differing degrees of emphasis on the technical versus aesthetic aspects of design and the extent to which formal lectures versus studios are used, studio learning is still core to most schools. Studio learning is inherently dy-

dynamic in nature and therefore hard studio approaches are hard to prescribe.

A critical part of the design studio in architectural education is the critique processes: the verbal communication among students, with the tutor and, often, external critics.

*The role of the design studio can be considered with three steps: (a) learn and practice some new skills, say, visualisation and representation; (b) learn and practice a new language as Schön described design as a graphic and verbal language; (c) learn to 'think architecturally' (Broadfoot and Bennett, 2003).*

In the ateliers the term Charrette was coined, which is still in use today. The term literally meant 'a cart' and referred to the practice of architecture students pulling a cart between the ateliers, collecting all the finished works for jury (Broadfoot and Bennett, 2003).

The term charrette also, historically, applied to the cart or tumbril used to carry the condemned to the guillotine. ...Hence the current meaning of work leading up to a deadline. (<http://en.wikipedia.org/wiki/Charrette>).

Today, the word charrette can refer to any intense, collaborative session in which a group of designers drafts a solution to a design problem in a time critical environment. The Design Charrette offers learning opportunities in a very condensed period that are difficult to achieve in the classroom by other means. The Charrette:

- generates engagement and an attitude of involvement
- develops an experience in and an appreciation of, the team approach
- broadens individual perspectives
- dramatically shifts the knowledge domain towards the applied
- dramatically increases individual confidence
- develops timeline awareness
- generates spontaneity, reacting to 'intuition' or 'feelings'
- generates reflection/action/reflection as a cycle.

#### 4. THE NEW MEDIA DESIGN CHARRETTE

##### Overview

In 2005/6 a Charrette was introduced into the New Media course as a way of learning-by-doing and integrating a range of knowledge and skills to solve a problem with a team in a limited time frame.

##### Structure

The New Media Design Charrette was held in week 10 of a 13 week course on New media in Business in which the major project for each individual student was to design a personal web site that expressed their own personal interests with the emphasis on an 'intimate' experience as the user was drawn to 'know' the author. By this time in the course the students had authored elements in graphics, sound, and video and had used all of the authoring tools necessary.

The Design Charrette was introduced at a point in the course where the students already had acquired significant skills in aspects of web design and needed to integrate and apply them.

##### The Groundwork

**Skills Development:** Programmed instruction was used to cover the theory of website design and to develop students' skills with the tools needed to build their websites. Instruction techniques included in-class demonstrations, pre-packaged tutorials, as well as short assignments related to elements of their final project. For example, the image assignment consisted of a CD cover for their final project, the video assignment was an introduction of themselves that was to be used in the final project, etc.

**Critical Comprehension:** Participating in a creative design environment requires the development of the discourse and the ability to give and receive critique through engagement in an interactive process. Several assignments were given and critiqued and served as a foundation for the Design Charrette. We began the design process of individual web sites with the development of a story board. This instigates the design questions the student will explore and also clarifies for the student the knowledge the student already has in place. Students then did a search and evaluation of several simi-

lar web sites to identify elements that they would or would not use as precedent in their own design. Precedent, that is, the historical development of designs, and the morphology (the form) of particular typologies (the taxonomy by use) are key concepts in architecture and these ideas were applied to web sites. A number of these websites were then presented to the class for evaluation. We used a schema based on the concepts, the feelings, and the function of each site to pull out what was good, and what was not, what worked, and what did not. The next step in the process of developing the discourse and critique was for each student to mock-up and present their home page design: Individuals were evaluated not on their presentation but on the quality and usefulness of the critical feedback that they gave to their peers.

These exercises were all presented to class for critique and discussion to enhance the design environment prior to the Design Charrette.

### **The Design Charrette**

The Design Charrette was run in one intense three hour session and was tightly scheduled through a number of phases. Students were assigned to one of two teams randomly by the instructor. The client gave a short presentation on what he was looking for. Each team was given a space designated by a white board and drawing materials, and a bank of networked and internet enabled computers to work with. A New Media manager was brought in to work with the teams.

The "client" outlined his requirements and needs for a site that documented an ongoing weekly event consisting of a variety of performers at a local art gallery. A range of materials were available including video and still photographs. The intended audience for the web site consisted of young urban professionals. The intended outcome of the website was to create a 'buzz' and promote sales of condos: each condo came with a piece of art from the gallery which was located across the street.

### **Tasks**

*1. Teams chosen by the instructor:* Teams can be chosen in advance to save time but our experience shows that as little fore warning of the charrette as possible works

best, usually just enough to generate some apprehension/excitement such as the warning to be on time for a special event. Teams were chosen randomly by instructor: sometimes it may be necessary to balance teams by skill sets and experience.

*2. Overview of timeline is presented by instructor:* The timeline is put up on the board and all the milestones are indicated and times set.

*3. Client introduced:* The client briefly presents an overview of the project and answers questions from the students and instructor.

*4. Each team is assigned board space:* Board space is necessary for the group dynamic so that everyone can participate in the process. Certain phases of the process, for example, developing the basic morphology, require participation and agreement from all of the participants. Other phases, for example client consultation, require a flexible and dynamic presentation technique that has low overhead. Critical to the studio environment is the use of a shared space.

*5. Team manager(s) introduced:* The team manager is introduced to the team and proceeds to inventory the team and assign roles. The team manager has each student list their names and skills on the whiteboard for the team to review. A team leader is chosen by the team and particular duties are assigned to individuals and groups.

*6. Client meets briefly with team:* The client meets briefly with each team to answer questions. The team reflect and present on the whiteboard the outline of two or three different initial design concepts for the client to comment on. The designs are diagrammed on the board in as much detail as possible in order to get as clear a direction from the client as possible.

*7. Client reviews alternatives:* The client reviews the alternatives and chooses one for development, or combines pieces that he likes for a direction for the team to follow. The team reviews the client's comments, modifies and clarifies one direction for development. The team then goes to computer stations for design development

*8. Intense building stage:* The team manager sets the team on task and coordinates



work, aligning decisions with the agreed upon concept.

*9. Review by client:* The client is presented work at 50 - 60% completion for comments, directions, and approvals. His comments are considered and implemented.

*10. Critical deadline:* All work must stop at the critical deadline and everyone must understand that design is over and be ready to go to the next mode which is the formal critical evaluation stage.

*11. Presentation:* The designs are presented to the entire class. Only questions of clarification are entertained at this point.

*12. Wrap up:* Open critical discussion with class, manager, client, and instructor is intended for the maximum degree of participation by the students. What is or is not the best solution is irrelevant: What is important is the discussion of the process and lessons learned.

## Results

Both teams invoiced in the Design Charrette produced respectable solutions and were able to demonstrate their ability to apply the tools they had learned to solving a specific problem. In addition, they functioned well as teams in spite of the fact that they had not worked together in these particular groups in the past. Although the class was small, feedback from the students was positive. The students that participated in the Design Charrette reported an enhanced and deeper understanding of web site development with direct application to their current work in the class. In the final course evaluation, many students indicated that the most significant process in the term was the Design Charrette. The Manager and the Client who participated in the Design Charrette both indicated that they were impressed with the development of the students' ideas during the course of the Design Charrette and the quality of the final product.

## 5. CONCLUSIONS AND IMPLICATIONS

Architecture has long been regarded as a reference discipline for information systems. Our small project suggests that architecture has more to offer information systems design than vocabulary. Architecture is a blend of art, science, and philosophy. Successful architects, like successful New Media design-

ers, need to design projects which function well but also are aesthetically pleasing and conceptually engaging. Teaching architecture relies heavily on action learning, an approach which offers a way of responding to increased demands for outcome based action learning in the IS field. The Design Charrette, a cornerstone of architecture education offers a practical and effective way of accelerating and enhancing learning in New Media design. We recognize that we cannot overstate our claims based on this small pilot project. Our ongoing research will evaluate further the application of the Design Charrette to other design areas in IS, for example, systems design.

## 6. WORKS CITED

- Alexander C., et. al (1977) *A Pattern Language: Towns, Buildings, Construction*. Oxford University Press, New York.
- Al-Rawi, A., A. Lansari, F. Bouslama (2004) "Model Curriculum for Undergraduate Degree Programs in Information Systems." *Proceedings of ASEE Annual Conference*, June 20-23.
- Boddy, D. (1981) "Putting Action Learning into Action" *Journal of European Industrial Training*, 5 (5).
- Boland, R. and F. Collopy (2004) *Managing as Designing*. Palo Alto, CA, Stanford University Press.
- Broadfoot, O. and R. Bennett (2003) "Design Studios: Online? Comparing Traditional
- Brockbank, A. and I. McGill (1998) *Facilitating Reflective Learning in Higher Education*. Open University Press, Buckingham.
- Burns, A. T., and Thomas N. Janicki (2003) "An Action Learning Model to Increase Critical Thinking Skills in an ALN Masters Information Systems Capstone Course" *Information Systems Education Journal*, 1 (24).
- DeLyser, R. R. and M.A. Hamstad (2000) "Outcomes based Assessment and a Successful ABET Accreditation at the University of Denver." *Proceedings of the ASEE/IEEE Frontiers in Education Conference*, October 18-21, pp. T1A/1 - T1A/6.
- Dilworth, R.L. (1998) "Action Learning - Setting the Stage" *Performance Improvement Quarterly*, 11 (1), pp. 5-8.

- Halstead-Nussloch, R. and W. Carpenter (2002) "Teaching and Learning Ubiquitous CHI Information Technology Management (ITM), Ryerson University (2005) ITM 445 Multimedia in Business. Toronto: Ryerson University. <http://www.ryerson.ca/itm/cos/itm445.html>
- Kurosu, M. and K. Kashimura (1995) "Apparent Usability vs. Inherent Usability." Proceedings of the Conference on Human Factors in Computing Systems (CHI), May 7-11, pp. 292-293.
- Lavie, T. and N. Tractinsky (2004) "Assessing Dimensions of Perceived Aesthetics of WebSites" *International Journal of Human-Computer Studies*, 60 (3), pp. 269-298.
- Lawson, B. (1997) *How Designers Think: The Design Process Demystified* (3rd ed.). Architectural Press, Oxford.
- Lee, D., E. Trauth and D. Farwell (1995) "Critical Skills and Knowledge Requirements of IS Professionals: A Joint Academic/Industry Investigation" *MIS Quarterly*, 19 (3), pp. 313-340.
- Lewin, K. (1948). *Resolving Social Conflicts: Selected Papers on Group Dynamics*. Harper, New York.
- Lindgaard, G. and C. Dudek (2002) "User Satisfaction, Aesthetics and Usability: Beyond
- McGann, S. T. and M. A. Cahill, (2005) "Innovative IS Project Management
- McGill, I and L. Beaty (1995) *Action Learning: A Practitioner's Guide*. Kogan Page, London.
- McGourty, J., M. Besterfield-Sacre and L. Shuman (1999) "ABET's Eleven Student
- Ngwenyama, O. and H. Klein (1994) "An Exploration of the Expertise of Knowledge Workers: Toward a Definition of the UoD of Knowledge Acquisition" *Journal of Information Systems*, 4 (1).
- Ngwenyama, O. (1993) "Developing End-Users' Systems Development Competence: An Exploratory Study" *Information and Management*, 25 (4), pp. 291-302.
- Ngwenyama, O. (1991) "End-user Systems Development as Collaborative Action Learning" *Journal of Management Systems*, 3 (1).
- Proudfoot, P. R. (2000) "Structuralism, Phenomenology and Hermeneutics in Architectural Education" *International Journal of Architectural Theory*, 2.
- Revans, R.W., (1982) *The Origins and Growth of Action Learning*, Chartwell Bratt Ltd., Bromley, UK.
- Revans, R. (1982) What is Action Learning, *Journal of Management Development*, 1, (3).
- Schenkman, B.N. and F. U. Jonsson (2000) "Aesthetics and Preferences of Web Pages" *Behaviour and Information Technology*, 19 (5), pp. 367-377.
- Schön, D. A. (1988b) "Toward a Marriage of Artistry and Applied Science in the Architectural Design Studio" *Journal of Architectural Education*, 41 (4), pp. 4-10.
- Schön, D. A. (1982) *The Reflective Practitioner – How Professions Think in Action*. Basic Books, New York.
- Shiratuddin, N. (2001) "Internet Instructional Method: Effects on Students' Performance" *Education Technology & Society*, 4 (3), pp. 72-76.
- Smith, P. and J. O'Neil (2003) "A Review of Action Learning Literature" *Journal of Workplace Learning*, (15) 2, pp. 63-69.
- Stamey, J., Honeycutt, T., Blanchard, S. (2005) "Edward Tufte Meets Christopher Alexander." In Proceedings of the 23rd Annual International Conference on Design of Communication: ACM SIGDOC. October.
- Stamey, J., Honeycutt, T. (2004) "Christopher Alexander's Fifteen Properties Applied to the Design of Communication." In Proceedings of the 22nd Annual International Conference on Design of Communication: ACM SIGDOC, October.
- Tractinsky, N., A. S. Katz and D. Ikar (2000) "What is Beautiful is Usable" *Interacting with Computers*, 13 (4), pp. 127-145.
- Tractinsky, N. (1997) "Aesthetics and Apparent Usability: Empirically Assessing Cultural and Computing Systems (CHI) 1997, March 22-27, pp. 115-122.

- Tufte, E. R. (1990) *Envisioning Information*. Graphics Press.
- van der Heijden, H. (2003) "Factors Influencing the Usage of Websites: The Case of a Generic Portal in the Netherlands" *Information and Management*, 40 (6), pp. 541-549.
- Wiedenbeck, Susan and Scott Henninger (2000) "Teaching Multimedia Design and Development to Computer Science and Engineering Students." *Proceedings of the 5th American Society of Engineering Education Midwest Section Conference*, April 5-7.
- Weinstein, K. (1995) *Action Learning*. Harper Collins, London.
- Winograd, T. (1996) *Bringing Design to Software*. Addison-Wesley, Reading, MA.
- Wong, Yue-Ling, Jennifer Burg and Victoria Strokanova (2003) "Digital Media in Undergraduate Computer Science Curricula: Updated and Detailed Report" *Technical Report 2003-2*, Wake Forest University, Winston-Salem, N. C.