Critical Thinking In A Digital World: Using Computers To Ask Questions

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"We shape our tools and they in turn shape us" (McLuhan, 1967)

Introduction

Landscape architects are struggling to make the transition to a digital world with computer aided design, geographic information systems, virtual reality modeling language and multimedia software. All of these are intended to help us manipulate, model and visualize our design ideas. However, there are This session will explore ways that landscape architects can use technology to expand their abilities as synthesizers of information. How can we use these tools to think critically about our work? How can we leverage the technology to expand our sphere of influence? The four panelists will address these and other questions. The presentation is as much about questions to ask as it is about answers.

Good designers understand that problem solving is not about technology, it's about process. Most landscape architects are good at putting themselves in the middle of other consultants, digesting information from a wide range of sources and synthesizing that information into a useable form for developing a solution. We think holistically about the landscape. We need to translate that holistic thinking to the role of computers in the profession.

If landscape architects are to take a leadership role in key design, planning, and environmental issues, we need to be proactive and demonstrate our abilities, especially when it comes to visualizing complex thoughts and ideas. Using digital tools effectively and creatively can help us achieve that goal. We need to learn to ask the critical question - "What do I need to do?" and then look to see what computer tools and data are available to help accomplish the task. Unfortunately, most landscape architects are at a loss about how to do this.

There are two essential questions that must be answered before intelligently using computer technology. How do I take technology and do what I already do better or faster? How does technology open up new possibilities and horizons that allow me to do things that I otherwise wouldn't be able to do? The focus is on the second question.

There are seven areas of thinking about technology:

1. Use digital tools as a way to expand your options, not limit them..
2. Learn from other disciplines.
3. Establish objectives and then select the appropriate tools.
4. Take a holistic approach to using technology.
5. The best time to learn about technology is now!
6. Focus on the software … and warmware – the people!
7. Tools are tools are tools!

New tools are now available that help designers question their assumptions and test ideas. Some are in the experimental stage while others are commercially available. One application being developed at the Massachusetts Institute of Technology allows the input and manipulation of

digital information through the manipulation of physical objects. For the landscape architect it provides a wonderful opportunity to integrate the "tactile way" of designing (making models, shaping clay) with the accuracy and processing power of the computers. A currently available application, Community Viz, allows communities to enter information about themselves and to ask questions about their future.

A New Approach to Communication

If one of our aims is to let the public become more involved in the planning and design of physical spaces, better methods and tools of urban simulation have to be developed. Ideally, these tools will communicate changes that are proposed so that non-design professionals can easily understand the impact of the proposed changes. These systems can be used not only as tools for design professionals but also as an interactive application to enrich communication and learning within the design process. The integration of such envisioning tools into the decision-making process will allow for better professional judgments while incorporating various stakeholders' expectations.

> Goal: to develop tangible visualization toolkits and interfaces that can be drawn upon by various users. These tools would include models for simulation and prediction, representation aids, direct manipulation interfaces, and collaboration tools.
> Hypothesis: Manipulative tangible interfaces that have the capacity to display and change data will effectively enable the understanding of otherwise abstract urban and spatial phenomena such as: impacts of aircraft noise, characteristics of various urban transportation options, climatic conditions or pedestrian flows.
> Significance: The development of new forms of information delivery and manipulation interfaces which provides access to the full efficacy of computational resources through physical gestures and common human interactions.
> Research Questions: How effective are tangible interfaces in communicating and manipulating information? How do such interfaces influence decision-making processes? How do such interfaces integrate with conventional representation tools such as drawings and plans? What is the right level of exhibited simulated information that is easily comprehended and understood? What kind of physical settings and interface ergonomics support interaction and collaboration?

Digitally Augmented Workspaces and Tangible Interfaces.

Many people find the "digital workspace" provided by desktop computers to be restrictive due to the size-constraints of the screen and the separation of input and display. The metaphor of the desktop is provided for its familiarity, but the experience of the two is not closely aligned. A digitally augmented workspace goes beyond the metaphorical and takes the physical environment as its starting point. This is then added to by digital inputs and displays.

At the Massachusetts Institute of Technology, the Media Lab Tangible Media Group in cooperation with DUSP's City Design and Development program have been involved with new technologies for creating intelligent 3-D models of buildings and sites. The Luminous Table, for example, can access and visualize data that exists about a site and its context in the city. Working with overhead projectors and cameras, the system has been used to study shadow

impacts, wind flow as modified by urban layout, and traffic effects of design alternatives. The table is dynamic, in that it can show the movement of shadows across a site as a day progresses; or the increase in traffic at rush hours on surrounding streets. The table is also interactive: the designer can change the size, form and location of buildings and simultaneously see the effects on streets, spaces, and movement.

Another tool, Illuminating Clay, allows designers to manipulate 3-D models of landforms and objects upon which visual data is projected as the shape is formed. Visual data may be topography, water flow, slope and aspect, cut and fill calculations, travel time, land erosion, or virtually any parameter that can be geometrically represented. A laser scanner continuously scans the three-dimensional model and calculates differences in shape. Furthermore, a perspective window allows users to explore and move through the clay model from a person's height. A link with the open source GRASS simulation software is under development and would allow an even larger analysis library. Both of these applications are ideally suited for collaborative work at remote locations. And because they operate in the familiar world of three dimensions, they allow teams of lay people as well as professionals to participate directly in proposing and evaluating design and development alternatives.

Using Community Viz in Glendale, Colorado

The Glendale Land Use Master Plan illustrates how tools for public decision-making' can significantly enhance both product and process. In Glendale there was a need to use 'public' values in every phase of the planning and design efforts. The process and information needed to be provided in order to ensure that citizens had the capacity to make good choices. The general questioning involved the following:

1) what units of measure should be employed to characterize 'good design' and 'bad design';
2) What is the short and long term implication of design and planning choices;
3) Visualization, what do alternatives look like and what will the final plan represent visually;
4) How can this plan become part of everyday operations of the municipality, thus invaluable to efficient implementation and management of this vision.
5) How can public participation become more efficient, less burdensome for participants, more meaningful to the process, and less time consuming.

The Community. Glendale Colorado completely surrounded by the City /County of Denver. It is the densest municipality in Colorado with an average density of over 15 people per acre. Aerial photography from thirty years ago depict the land as primarily dairy pasture with suburban Denver surrounding it. It developed during the boom of Big Box and has been unsuccessful at engaging it's citizens at creating a common vision based upon common values. There was a vague vision for a mixed use development, but there was no sense of where this mixed use downtown should be located or look like. The implications to traffic, jobs, tax revenue, affordable housing, walkability, parking, local ownership, community identity and infrastructure were all important performance standards to enable citizens to choose wisely.

A careful public involvement strategy was used to: 1) empower common citizens; 2) provide for more meaningful citizen involvement; 3) provide capacity to address very complex, interrelated

issues; 4) create high levels of consensus; 5) compress public participation to half the time that is normally required.

The Tool. To help answer the questions CommunityViz was used as the tool for public decision-making. CommunityViz is an add-on to ESRI's ArcGIS software and provides a set of functions designed specifically for public meeting interaction. Community Performance Standards are coded into the software as 'Indicators'. The indicators can be simple variables or complex census data. A 'slider-bar' is provided with each indicator to facilitate interacting with the variables related to each indicator.

For example, a single family residence generates 6.9 vehicular trips per day, yet if someone challenges that assumption, an on screen slider-bar allows the user to test other numbers. Thus the impact of changing that variable to 7.6 or 5.3 can instantly be computed, showing the total impact of that change. The sensitivity of multiple variables that are linked together to create complex indicators can also be evaluated. In Glendale, for example, everyone thought that the price of land was the most important variable affecting the affordability of housing, and through 'sensitivity analysis' it became obvious that Interest Rates were by far the most significant component.

When a community has recognized constraints maps that limit the kind of development that can occur. CommunityViz will inform the designer whenever there is a conflict between land use and constraints. This enables the designer to focus on content issues.

The integrated 2D and 3D components of the software allowed participants in public meetings to evaluate the affects of scale and massing. Changes within either environment were reflected in both, thus allowing the participants or designers to quickly evaluate the spatial implications of specific buildings and features. The revised elements were instantly rendered to produce realistic simulations of the visual impacts. The combination of good process and sophisticated tools for public decision making made this process a success in just 6 months.

Conclusion

These are just a few of the innovative tools available to landscape architects for planning and design. How we use computers to think critically about our work will in large measure determine our profession's success.