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GETTING THE SHOE TO FIT:
ACADEMIC INSTITUTIONS, TECHNOLOGY, AND ARCHITECTURE

With architecture as a frozen icon of a culture's thinking and behavioral patterns, university architecture mirrors past academic customs. Examining the historical development of academic institutions assists in understanding the chronological acceleration of our future predicament. The predicament being identified is that of "future-proof" planning and designing for the future academic campuses that will lead our culture to the years of 2020 and beyond.

First the user group needs identifying along with the technology that will be supported by architecture. Today it is not uncommon for toddlers to be learning eye-hand coordination skills and other cognitive developmental skills on computers using specially created children's software. Consider, these toddlers will have approximately seventeen years of computer association before entering college or the business world (using today's standards). Currently it is becoming typical for elementary schools (kindergarten through the 12th grade) to use computers as learning aids. In Hawaii there is a ratio of one computer per ten students (Tschumy, 23 Mar. 99, sec B, p. 1). With the installation of fiber optic infrastructures being added to existing schools and inclusive in new schools, this ratio will greatly lessen in coming years. Accompanying this learning experience is the addition of video studios to expose students to producing learning scenarios (Ishikawa, 3 Mar. 99, sec. B, p.1). Consider, these students will have one to twelve years exposure to advanced learning processes before entering college or the business world.

There are inherent problems that parallel technological exposure. These are in the areas of data input and output. Typically people read between 375 – 500 word per minute. Keyboard skills limit input to approximately 50 words per minute, while voice recognition input programs allow approximately 80 words per minute input. People (students) are limited by these abilities to access and disseminate data. In the ensuing generations compressed and abbreviated, but equally effective, language of symbols and sounds will be initiated. Micro implants might aid to facilitate these processes. At this time technology has produced virtual retinal display (V.R.D.) systems. Laser images are projected onto the retina of the eye. These images can range from transparent or opaque. V.R.D. technology will lead the way to employing eyeglasses as monitors. Already wearable computers are being integrated into clothing. In the exponential technological developments of the past and the anticipation of the future, one element has remained constant – the drive for miniaturization of systems. Currently technology is experiencing the micro-age. Very likely the nano-age will have its integrated place by the year 2020.

In light of the dynamic developments of the technological world upon educational processes, what and how can an architect provide “cutting edge” environments within the academic arena. Unfortunately, there exists a major obstruction that prevents technology and architecture of arriving simultaneously. Decision makers – administrators and legislators – who have in the past sponsored zero-defect solutions need to re-evaluate society’s tolerance for risk and for the failure that sometimes comes with it. When dealing with overwhelming variables and consequences, and with time lines as an issue, erratic social and science barometers cause these individuals to be placed in a position of second-guessing on issues of future academic

developments (Ignatius, 14 Mar 99, sec. B, p. 1). Resolution will require innovation to accommodate the onset of developments in the evolution of the next generation campus.

In the past, campuses have had physical boundaries and they could acquire an architectural style that would dignify their identity. However with the projected digital or virtual campus, physical boundaries have the potential of being non-existent. If history repeats itself, the advent of the computer and the digital revolution will not render the “walls and halls” of higher education institutions obsolete; rather the institutions and technology are more apt to reinforce and re-invent new mutual applications and advantages. The Hawaiian Department of Education has substantial documentation that validate this in the fact that schools with computer learning programs, have experienced a rise in usage of libraries since the installation of computers.

Current higher education practices require the decision-making processes to allow educational evolution to occur. Much of the curriculum delivery practices are similar to the chalk board professor/dictator of the founding days of the University of Virginia.

The aggregation of educational material into courses, and that they exist only in that form, hinders any significant form of individualized (negotiated) learning. The rigidity of course synopsis and prescribed activities commits curriculum delivery to largely a teacher-led mode of teaching-learning (not research-learning). Current curriculum practices are frequently identified as being: teacher-led, paced for the average student, calendar-defined, scheduled on-site, and centralized (Halim, Pelanduk,106-110).

To best utilize the advantages of technology and higher education, curriculum delivery needs to recognize the potential of:

1. Knowledge building, not knowledge transfer
2. Capability-based, not knowledge based

3. Open to negotiated learning, not simply prescribed
4. Paced for the individual, not the average
5. On demand, not scheduled
6. Flexible, not calendar-defined

These aspects of curriculum delivery are evolving into student expectations in the forms of: interactive computer-assisted learning, electronic lectures, distance and open learning, and global learning through networking (Halim, Pelanduk Publications, 111-125). At the same time, the function of buildings fails to support the transition to new curriculum delivery methods. Inadequate electric power supply and building cooling systems, along with inflexible interior walls also fail to meet user needs. Thus, buildings evolve into obsolescence.

Because of variables future curriculum development and the tenuous complexity of defining campus reuse and expansion, identifying an appropriate methodology for effective planning and designing is a difficult issue. The University of Hawaii at Manoa exemplifies many academic centers with future growth dilemmas. For the University of Hawaii at Manoa, idiosyncratic variables involve political objectives, regional economic development, funding processes and priorities, educational philosophies, an aging physical plant, future technological impacts, and the development and construction of a new city and university campus in west Oahu. In this situation “traditional” design methodologies lack the flexibility to account for the unknown and unaccountable, scenario-buffered planning offers the potential to remedy the dilemma.

Scenario-buffered planning processes are excellently defined in the book titled How Buildings Learn authored by Stewart Brand in 1994. Brand familiarized himself with scenario planning while consulting with large multinational corporations. He later adapted his insights to accommodate architectural planning. He notes that many buildings are a brilliant design solution

to the wrong design problem. With buildings being such a huge investment, the job of scenario planning is to question whether a building is really needed at all and, if it is, to help insure it to be a flexible tool.

Brand's research has identified that the worst mistakes in the planning/design process comes not from wrong decisions, but from faulty planning for a contingency that was never addressed during design. One of his iron rules of planning states that "whatever a client or an architect says will happen with a building in the future, won't". The future can not be successfully predicted. This process allows the building design questions to be framed in a larger context so that instead of leaping to "we need a bigger building", the more general problem, "we need to handle our growth" can be explored. The scenarios developed expose gaps and oversights that might otherwise be passed-over in the pre-design phase. Scenarios also test the validity of "fond notions – wish lists" that might go unchallenged. By nature scenarios are basically conservative and innovative, and they offer avenues in the strategizing process for ingenious design ideas to emerge. Scenario planning does not advocate ignoring existing means of planning. Life-cycle costing, virtual reality computer modeling, methods introduced by building programming consultants all require a host of information retrieval methods and interpretation methods (Sanoff, 1977). Scenario planning offers check-and-balances.

The integrating of scenario planning into a building project begins at the time when preliminary programming allows the development of an "official future" plan of the building. This will provide a sounding board for the responses and challenges presented by scenarios. Scenarios are frequently developed by stages with research done between phases to pursue the new questions that scenarios inevitably raise. The formulations of an initial vision for the

building should be explored and woven into the understanding of these challenges. The sequence of events to initiate scenario planning can be summaries in ten steps:

1. Interview the major players – chancellors, administrators, deans, faculty, legislators, architects, planners, engineers, and contractors – to acquire their vocabulary, the major issues, and the consensus expectations about the future. This may be accomplished by forums, interviews and questionnaires.
2. Explore the “driving forces” that will be shaping the future environment, such as changes in technology, regulations and codes, the competition, and the user.
3. Rank the driving forces in terms of importance and uncertainty. The most important and most uncertain rank the highest because it is the important uncertainties that are the most disruptive.
4. Identify “predetermined elements” – reliable certainties.
5. Identify scenario logic – basic plot lines. The goal is to develop scenarios that are both plausible and surprising. (Identify the “official future” as one of the scenarios.)
6. Start thinking the unthinkable. Typically these scenarios soon acquire a frightening plausibility which makes a mockery of the “official future”. Good scenarios always introduce an element of novelty in a new concept, thought, or discovery.
7. Naming the scenarios is important. There should be two to five scenarios.
8. Return to the focusing issue or decision to devise a strategy that will accommodate all the scenarios. Avoid “bet-the-company” strategy. Develop a “robust” strategy that is viable in the variety of futures. A “regret analysis” strategy is frequently useful.
9. As strategies emerge, the developing scenarios need to be played-out and cycled through to get a set of scenarios and a strategy that makes sense.

10. Finally, identify some leading indicators that will be monitored to identify which scenario actually occurs in life.

To assist in analyzing which strategies present the positions that increase options, matrix methods need to be developed to allow prioritization (Brand, 1994, 178-187).

Brand insists that real world rule-of-thumb guidelines need inclusion. Some pertinent elements include:

1. Overbuild structures so that heavier floor loads or extra stories can be handled later.
2. Provide excess services capacities.
3. Oversize (“loose fit”) rather than undersize
4. Separate high and low volatility areas and design them differently.
5. Work with shapes and materials that can grow easily, both interior and exterior.
6. If possible, use materials from near at hand.
7. A spatially diverse building is easier to make use adjustments than in a spatially monotonous one.
8. Medium and small rooms accommodate the widest range of uses.
9. When in doubt, add storage.
10. Shun designing tightly around anticipated technology. Design loose and generic around high tech.
11. Do not design by default. (minimum code requirements)
12. The most convenient form of expansion is cellular.

Scenario planning and programming combine to allow the creation of a design strategy that does not ignore the future. The future architecture of academic institutions envisioned by the use of scenario planning require flexibility and suggest buildings that are:

1. Horizontal, overbuilt, simple buildings connected to the environment.
2. Incomplete, impermanent, inexpensive and just barely good enough to work.
3. Structures easily adapted by users.
4. Working with interior and exterior shapes and materials that are easily alterable.
5. Enabling the user to freely experience technological accessibility and the synergy of their needs.
6. Designed with peripheral stair, elevator, and utility cores and an open floor plate.
7. Developed with considerations to environmental psychology.

The evolution of a campus is a process that is frequently fragmented by many considerations. However, the factors that impact the future of the campus hinge not so much on the lack of innovative building materials or restrictive building codes, but on public sentiment that needs to embrace the advancement of the future, and planning processes that recognize future change.

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