

## **Virtual U.: Origins and New Release**

Remarks to the First Adopters Workshop  
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First, let me offer several thanks. At the end I will offer some money prizes.

The first thank you is to each of you for giving up a weekend to work on behalf of improving US higher education. To those of you from out of town, an added thanks. No one would say coming to Philadelphia on a Friday night in February is a junket.

I also want to thank the talented, hard-working team that created this meeting. Let me begin with Pam Erney, the project manager here at Penn, and the rest of her colleagues, Susan Shaman, Doug Toma, Luisa Boverini, and Robert Zemsky. And for Digital Mill, Ben Sawyer and his colleagues. And of course, the designers and builders of Virtual U, in absentia, Bill Massy and Trevor Chan.

This evening I would like to share the history of Virtual U., and then speak about what we might accomplish together this weekend.

The story begins on a spring day in 1995 in Palo Alto. I was visiting Bill Massy, then a professor at Stanford. Bill was analyzing why graduate students took ever longer to obtain doctoral degrees. Managing the Sloan Foundation's program on "the university as a system," I was concerned not only about specific problems such as the 9 years doctoral students averaged to acquire degrees but also about how the many problems connected to one another. The university was a jangly torso, in which the hip

bone connected loosely to the thigh bone, and on down to the big toe. But no one seemed to have a working model of cause and effect. Indeed, perspectives on the university seemed to show it as all muscular thigh, all deft fingers, or all thick skull. I wanted a crude look at the whole.

So, after hearing Bill's impressive analysis of the time required to reach a degree, I inquired, what would you really like to do? After a couple of tentative starts, Bill's eyes lit, exclamations began, and he ran to a file cabinet and pulled out a memo he had written some months earlier proposing to build an interactive video game of the US university. I said, yes, yes, and we shook hands.

Back in the mid-1980s I had edited a book on "Cities and Their Vital Systems". Shortly after the book appeared, a call came from California in a very youthful voice, asking, "Hey, I am trying to build a game about building and managing a city. Would you mind if I draw on some of the ideas in your book?" A few weeks later a beta version of SimCity arrived in the mail for testing. The voice was that of Will Wright, the genius of simulation games, and the rest is history.

Amazed by Will's succession of accomplishments, I knew by the mid-1990s that if we could simulate cities and battlefields, skyscrapers and ant colonies, then the US university was not beyond reach, at least Bill Massy's reach. So began a gratifying collaboration, requiring a range of advisors and experts, most notably the superbly talented Trevor Chan of Enlight Software.

Now let me make an important point with regard to games. Successful games require at least three kinds of skills. First, you have to know the content. That content might be the Civil War or Baseball. You have to know what the issues, questions, and struggles are. Second, you need to be able to **reduce** content to a

numerical or algorithmic model. Underlying every game, including Monopoly, is a numerical model. There are many people who have content expertise but cannot reduce that expertise to a model. "Reduce" is a key word. Any model or game is reductionist - the goal is to extract the essential rules of behavior, of cause-and-effect. Now, there are some people with content expertise who can also model, or pairs of people that can. But very few of them know how to build successful **interactive** simulations, **games**. Happily, there is a flourishing craft of game-building. There are people who understand what makes games work, whether the game is about the Civil War or building hotels.

I understand the need for this triad of content experts, modelers, and game designers now. I did not understand it when we began Virtual U. I had built models myself, of energy systems, for example. As a researcher, my priority had always been accuracy - the models were basically for **forecasting**, or for **controlling** systems. A model or simulation of an oil refinery can be used to make precise decisions on which safety and revenue depend. Importantly, Virtual U is a model for **teaching and learning**, not for real-time operational **control** of an oil refinery.

It would not surprise me if some of the people in this meeting help advance the state of the art in university simulation, so that in 10 years, we have models that serve for control, for decisive management. For the present, and it is a huge step forward, we have a game, for teaching and learning.

The VU creative team tried to balance the numerous desires of users. Diverse and numerous user desires pushed Virtual U toward complexity. Those concerned with faculty careers wanted a detailed model of hiring and promotion. Those concerned with athletics want a sophisticated sports model. Those concerned with tuition and student aid want a subtle treatment of tuition assistance. We had terrific content advisors, including David Breneman, and

they convinced us that at the outset, VU should at least be quite a complete framework. All major university functions should be represented in the game; each important function should have a building on the campus map, the game interface: library, development office, stadium, and so on.

Perhaps we have gone too far toward complexity. As you will see, getting started in VU, getting to know the campus, takes some time. But the virtue is that there is at least a rudimentary module for each function. If the product is successful, modules can be deepened, and new modules could be added and plugged in, for example, a law or a business school.

Everyone agreed that everyone involved with universities, from parents to state legislators to the millions of employees including faculty tends to have a very partial view of these complex systems. Contemplating a campus, one person sees a huge first-year history course, another sees the football stadium, and a third sees a research laboratory. Much of the effort in VU has gone into knitting these together. The yarn is basic: money. Every decision translates, directly or indirectly, into revenue or expense. In considering how to convey the university as a system, we concluded there was no better way than through an annual budgeting process. The way the player, or the president, finally sees the institution synoptically is through financial flows.

People from many academic disciplines have valid perspectives on the university. I guess in this room we have sociologists, political scientists, and historians as well as economists. Virtual U has a strong flavor of economics and finance. At the same time, we hope that its use will stimulate discussion and debate from many other perspectives about exactly what are sound models of the university.

One of the innovations in Release 2.0 is that the player can adjust the weights of the components that make up the score. The components include measures of financial health, scholarly output, degrees granted, diversity, and morale. Simply debating the list of components for the score and their proper weights has already proven to be a startlingly educational exercise in several VU sessions that I have attended.

More generally, we hope that Virtual U proves useful for education of exactly the kind you all provide. We have all learned in the last decade that point-and-click is a great evolutionary way to learn. You can try things out, you can live twice. You can clamber way out onto a thin branch, but then return and try another branch. You can see a totality in a few minutes or hours that in real life would require years or decades. We hope those involved in teaching about higher education and those who want to learn about it will find Virtual U an intense, stimulating, modern means to lift understanding.

I scarcely need to mention here that many of those who manage the higher education enterprise, including department chairs, deans, provosts, presidents, and trustees, have had little chance to play before they find themselves dealing with real students, real professors, and real alumni.

In fact, with Virtual U, higher education is climbing on a juggernaut. More and more people lead dual lives: in real life and *in silico*. Many occupations are grateful to take risky decisions first in a simulator. Airplane pilots prefer to learn the consequences of playing with a joystick on the ground to chancing a crash from the air. In general, humans learn by play. As do other animals. Watch kittens leaping about, rehearsing for the hunting that later may enable them to survive.

We hope that VU sets the precedent for exploring the university as a system on-line, to the benefit of all the stakeholders in the higher education enterprise. Surely aspects of the university are ineffable, but so are aspects of battlefields, factories, and motorcycle racing, all of which have yielded to quite successful simulation.

Interestingly, some of the most heated debates about Release 1.0 were about whether the model was too stable, whether it was too hard to ruin the player's university. I would say, this is one of the lessons, that universities are quite loosely coupled organizations in which it often takes many, persistent decisions to achieve major change. If the University of Pennsylvania had been managed by the top executives of Enron for the past 3 years, Penn's stock would still be quite high.

Although advancing higher ed research is not the purpose of this weekend's meeting, it is worth keeping in mind what simulation can also offer in this regard. We believe Virtual U proves encouragingly that it can be done, that it is possible to model and simulate a university on a computer. We hope investigators will deepen and elaborate every module in coming years, and begin to make them predictive, not simply generally right. The source code of Virtual U is freely available to those who want to extend research in higher education through simulation. So, if any university represented in this room wanted to customize the model and input its own data about salaries, applications, and so on, it will be possible. For now, the game offers generic universities that may resemble yours, but not is not a facsimile.

I might also mention a couple of extensions that users of Release 1.0 have proposed but are not incorporated in Release 2.0: --to consider the relation of universities to regional economic development

--to change the perspective from that of the president of the institution to those of students or faculty.

My point is simply that the game, simulating the university, our enterprise, is still young.

On behalf of the Alfred P. Sloan Foundation, I am enormously grateful to the team who have made VU possible. William Massy above all merits appreciation for his development of the mathematical models that underlie the simulator. Trevor Chan and his colleagues at Enlight Software translated the Massy models into interactive programs. Robert Zemsky and colleagues here at the Institute for Research in Higher Education at the U. of Pennsylvania assembled the data used in the simulator, and now spearhead the development of its educational applications. Ben Sawyer of Digital Mill managed the process to bring together the several components of the product package, including the Manual, Strategy Guide, and Website. The Spencer Foundation joined Sloan in making available the resources needed to create Virtual U.

In the end, it will be the development of a **community of users** and the contributions they make, through feedback and their own creativity, that will make Virtual U. valuable. The Sloan Foundation Board was impressed by the reaction to Release 1.0. Critics acclaimed it, notably making it one of 10 finalists for the Best Independent Game of the Year at the international Games Festival last March in San Jose. (The winner turned out to be Shattered Galaxy, in which the player was NOT a university president.) And users put it to work, especially in classrooms and for executive and management training. Consequently, Sloan agreed to support a new release and to make it freely available, downloadable from the web, making the product much more accessible, especially for students.

In this spirit, I want to engage all of you. Release 2.0 is not the end. In fact, we know Release 2.0 is a very large space to

explore and it surely has bugs that the beta testers did not yet uncover. The VU team is committed to a Release 2.1 later this spring. Sloan will award up to 10 of you \$500 each for filing a substantial bug report, by cob Friday 22 February. Ben Sawyer will share with you later in the weekend forms for bug reporting. So, go home and play quick, and hope for a crash!

Bob Zemsky will be talking with you shortly in detail about the plans for the weekend. But let me just offer one caveat and a few guidelines. The caveat is not to obsess over the detailed accuracy of the game. It is a learning tool, not an operational model for dispatching ambulances. The question is "What can learners win from it?" The guidelines are:

- Think about VU's educational uses at all levels: undergraduate classes, master's courses, doctoral seminars, executive training and short courses, contests;
- think about many ways to use it: in one class, for a few classes, or as the spine of a course for a semester;
- think about it at various levels of detail, as an introductory gloss on a campus or as a numerical model whose code is accessible to computationally-minded students;
- think about VU as a complimentary asset, in conjunction with readings, role playing, and other educational strategies and materials; and finally
- be selfish: keep your own courses in mind.

Importantly, keep in mind that you are not alone. In fact, the goal is that you all will become the heart and brains of a super savvy VU users club: sharing ideas with one another: giving feedback to Ben, Bill, and Trevor about future releases; and networked and supported by the VU team here at Penn.

In summary, we hope this weekend marks a historic step by the leading teachers of higher education into the inevitable world, full of fresh potential, of learning *in silico*. Thanks very much.