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A paradigm for developing computerized business gaming simulations is discussed. Simulation is defined as a replicable representation of a process. Phenotypical representation, or modeling, is distinguished from genotypical representation, or gaming. Definitions of a configurable game, strategy, tactic, and entrepreneurship as they relate to specific games are presented. Gaming simulations should be evaluated on how well they support the genotypical representation of the processes that define the subject of interest. Computerized business gaming simulations may be more appropriate for the assessment of business education than for the enhancement of that education.

KEYWORDS: *assessment; business gaming simulation; computerized simulation; definition; design paradigm; gaming; genotypical; modeling; phenotypical.*

Recently, I started working on a computer-assisted gaming simulation for a client-server environment. In this setting, a server computer interacts with a client computer that in turn interacts with a person. I am using the Java programming language in my work. Although these software tools are much different from those I started with more than 15 years ago, the paradigm that organizes my efforts has remained largely unchanged.

I design gaming simulations that encourage participants to develop particular solutions to particular problems, guided by principles that may apply. I rely on the computer to balance accounts, to enforce rules, to simplify situations, to track activities, to score performance—generally, to do as many of the incidental chores as I am able to program the computer to do, so that people might think. I want participants to think of core issues. To get that result, I minimize incidental issues. I aim for a genotypical representation of the things that matter and settle for a phenotypical representation of the things that do not matter, but which must nevertheless be included for the coherence of the work.

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Genotypical and Phenotypical Representations

I define the term *simulation* as a replicable representation of a process. The representation can be phenotypical or genotypical. If phenotypical, it is a reflection of the process; if genotypical, it is a subset. Thus, a phenotypical representation of employment would have participants employ fictitious persons; a genotypical representation would have them employ each other. Computer animation might make the phenotypical representation realistic, but it cannot make it real. Genotypical representation, however, is real.

Both kinds of representations have their imperfections. The adequacy of the phenotypical representation depends on the algorithm. If the algorithm is wrong, the game indoctrinates error. Thus, if the simulation erroneously rewards the hiring of an unsuitable candidate, the student is misled. On the other hand, the adequacy of the genotypical representation depends on the conditions that must be imposed to make it viable. These conditions may so deform the process that the salient aspects of the process in its natural state are lost. Thus, if the game constrains participants such that neither can refuse to work with the other, the genotypically represented employment process becomes a farce.

I have worked with both types of representations. I have developed models that phenotypically represent product demand (Thavikulwat, 1989), human resources (Thavikulwat, 1991a, 1991c), product quality (Thavikulwat, 1992), and multiple industries (Thavikulwat, 1993). I also have developed gamed procedures that genotypically represent product markets, resource markets, and stock markets (Thavikulwat, 1982, 1983, 1990, 1992, 1994a, 1994b). I consider the phenotypical representation useful for capturing the incidental processes of a gaming simulation. Although generally the easier method, it compromises truth (Bankes, 1993). I consider the genotypical representation essential for capturing defining processes, where anything less than the truth would be a fatal flaw.

I concur with Crookall, Martin, Saunders, and Coote (1986), who referred to simulations built around genotypical representations as computer assisted and who noted that those simulations "will have greater scope and potential than other types when social and socially-mediated processes and skills are seen as important learning outcomes" (p. 370). Even so, I have found that the technical and administrative difficulties of the genotypical representation can be enormous.

Technically, a genotypical representation requires that the computerized game be programmed to accept a wide range of participant responses in a manner that is dependable and facile. I have found that this requirement

mandates use of the file-sharing capabilities of a local area network, and of unusual timing mechanisms (Thavikulwat, 1996).

Administratively, the conditions of genotypical representation can encourage unwanted antagonisms and conspiracies among participants. Nevertheless, I have found it possible to limit these difficulties, sometimes by restricting participants' freedom with computer-enforced rules and sometimes by expanding their freedom with more efficient computer-aided procedures (Thavikulwat, 1995).

Concepts and Terms

I have found that the process of developing gaming simulations is one of creating concepts and defining terms. Often, I did not first create the concepts or define the terms. Rather, I started with the sense that the project would be fruitful precisely because the concepts and terms were not entirely clear. My sense of the concepts became clearer as I worked, and my definitions became more precise.

Thus, I came to the concept of the configurable game as the inverse of the frame game (Thavikulwat, 1988) while developing the business operations game, MANAGEMENT 500. Whereas the frame game has constant structure and variable content, the configurable game has constant content and variable structure. I designed MANAGEMENT 500 so that it could be configured to emphasize either discovery, perseverance, or competition in learning.

Strategy and tactic are terms that I had to define for the business strategy game, CEO. I arrived at the definition of strategy as the process of setting parameters and of tactic as the process of changing variables (Thavikulwat, 1991b, 1991c). These short definitions highlight the difference between the two related terms, without the conjunctions and qualifiers of other definitions (MacCrimmon, 1993; Summer et al., 1990).

I did not create the entrepreneurship game, DEAL, with the intent of developing a gaming simulation for entrepreneurship education. That occurred later, when I saw that entrepreneurship was executive deal making (Thavikulwat, 1995), a definition that took from Barnard's (1938) classical definition of an executive as one who specializes in "maintaining systems of cooperative effort" (p. 216) and adding to it the definition of a deal as an irregular business event.

Recently, I needed to delineate the basis for evaluating gaming simulations. I could not accept participant-based criteria, such as Low, Venkataraman, and

Srivatsan's (1994) "enthusiasm among the students" and "impart useful knowledge" (p. 390), because these suggest that gaming simulations have low value, inasmuch as lack of enthusiasm is an issue only among students who do not care about the subject matter and useful knowledge can readily be imparted by the simpler methods of text and lecture. Sharing Ifill's (1994) view that gaming is serious business, I proposed that "a gaming simulation should be evaluated on the extent it games defining processes with administrative ease" (Thavikulwat, 1995, p. 341). My rationale is straightforward. Every gaming simulation is designed to capture something. The defining element of that something should be represented genotypically (i.e., gamed) so that truth is not compromised; and the administration of the game should be easy, so that playing it will be practical.

Conclusion

With over a decade of work in computerized business gaming simulations behind me, I no longer feel as I did earlier that I have to work quickly before others overtake me and render my works obsolete. Now I realize that few are doing the work I do. Our competition is not with our academic colleagues, but with the computer technology upon which our works rely. Its development and replacement renders archaic and unusable in a few years work that can take several years to create.

I agree with Wolfe's (1994) observation that professors of business administration have generally been slow to incorporate business gaming simulations in their teaching and research, but I disagree that "the basic discovery phase of business gaming has ended" (p. 277). Still, I generally agree that "the simulations being used today are not that much different from those created in the late 1950s" (p. 276), but I would qualify, as does Teach (1993), that there are a few exceptions.

I have come to conclude that the appropriate role for computerized business gaming simulations is not in the enhancement of business education per se, but in the assessment of that education. Although computerized business gaming simulations may enhance business education, as the studies reviewed by Keys and Wolfe (1990) have suggested, the enhancement comes invariably at a high cost in students' time. Thus, concepts that can be covered in 1 hour's lecture can require 10 hours' involvement in a computerized gaming simulation. With assessment, however, the cost in students' time is unavoidable, because assessment requires observing how students behave within the context for which they have been taught. For this purpose, computerized gaming simulations' advantages of objective scoring, comprehensiveness,

flexibility, and ease of administration are unmatched by other instruments of assessment (Thavikulwat, 1994a, 1997).

Accordingly, I believe that the basic discovery phase of business gaming has only begun. The client-server technology I am involved with today engages me. I am hopeful that many others will join me in this direction so that 15 years from now, no one in this field will have to complain, as Wolfe and Crookall (1998) recently did, about its slow progress.

References

Bankes, S. (1993). Exploratory modeling for policy analysis. *Operations Research*, *41*, 435-449.

Barnard, C. (1938). *The functions of the executive*. Cambridge, MA: Harvard University Press.

CEO: A business simulation for policy and strategic management. Thavikulwat, P. (1991-1998). New York: McGraw-Hill (1221 Avenue of the Americas, New York, NY 10020, USA) and Towson, MD: Towson University (Dept. of Management, Towson University, Towson, MD 21252, USA; http://www.towson.edu/~precha/ceo.html).

Crookall, D., Martin, A., Saunders, D., & Coote, A. (1986). Human and computer involvement in simulation. *Simulation & Games*, *17*, 345-375.

DEAL: An international-business gaming simulation. Thavikulwat, P. (1994-1998). Towson, MD: Towson University (Dept. of Management, Towson University, Towson, MD 21252, USA; http://www.towson.edu/~precha/deal.html).

Ifill, D. (1994). Taking gaming seriously: Not anymore. *Simulation & Gaming*, *25*, 211-214.

Keys, B., & Wolfe, J. (1990). The role of management games and simulations in education and research. *Journal of Management*, *16*, 307-336.

Low, M., Venkataraman, S., & Srivatsan, V. (1994). Developing an entrepreneurship game for teaching and research. *Simulation & Gaming*, *25*, 383-401.

MacCrimmon, K. R. (1993). Do firm strategies exist? *Strategic Management Journal*, *14*, 113-130.

MANAGEMENT 500: A business simulation for production and operations management. Thavikulwat, P. (1989-1998). New York: McGraw-Hill (1221 Avenue of the Americas, New York, NY 10020, USA) and Towson, MD: Towson University (Dept. of Management, Towson University, Towson, MD 21252, USA; http://www.towson.edu/~precha/m500.html).

Summer, C. E., Bettis, R. A., Duhaime, I. H., Grant, J. H., Hambrick, D. C., Snow, C. C., & Zeithaml, C. P. (1990). Doctoral education in the field of business policy and strategy. *Journal of Management*, *16*, 361-398.

Teach, R. D. (1993). Forecasting and management ability: A response to Wolfe. *Simulation & Gaming*, *24*, 63-72.

Thavikulwat, P. (1982). BLOCKS & CHIPS: A computer-assisted, genotypical entrepreneurial game. *Developments in Business Simulation & Experiential Exercises*, *9*, 273-275.

Thavikulwat, P. (1983). BOSS: A behavioral-quantitative, computer-supported game. *Developments in Business Simulation & Experiential Exercises*, *10*, 85-87.

Thavikulwat, P. (1988). Emphasizing different modes of learning through a configurable business simulation game. *Simulation & Games*, *19*, 408-414.

Thavikulwat, P. (1989). Modeling market demand in a demand-independent business simulation. *Simulation & Games*, *20*, 439-458.

Thavikulwat, P. (1990). Consumption as the objective in computer-scored total enterprise simulations. *Developments in Business Simulation & Experiential Exercises*, *17*, 167-169.

Thavikulwat, P. (1991a). Modeling the human component in computer-based business simulations. *Simulation & Gaming*, *22*, 350-359.

Thavikulwat, P. (1991b). Operationalizing strategy with participant-modifiable parameters. *Developments in Business Simulation & Experiential Exercises*, *18*, 147.

Thavikulwat, P. (1991c). Rebuttal to Wolfe's comments on modeling the human component in computer-based business simulations. *Simulation & Gaming*, *22*, 365-367.

Thavikulwat, P. (1992). Product quality in computerized business simulations. *Simulation & Gaming*, *23*, 431-441.

Thavikulwat, P. (1993). Multiple industries in computerized business gaming-simulations. *Developments in Business Simulation & Experiential Exercises*, *20*, 108-109.

Thavikulwat, P. (1994a). CEO II: A gaming simulation for assessment. *Developments in Business Simulation & Experiential Exercises*, *21*, 173.

Thavikulwat, P. (1994b). DEAL & GEO: Progressively integrating gaming simulations for entrepreneurship and international business. *Developments in Business Simulation & Experiential Exercises*, *21*, 178-179.

Thavikulwat, P. (1995). Computer-assisted gaming for entrepreneurship education. *Simulation & Gaming*, *26*, 328-345.

Thavikulwat, P. (1996). Activity-driven time in computerized gaming simulations. *Simulation & Gaming*, *27*, 110-122.

Thavikulwat, P. (1997). Real markets in computerized top-management gaming simulations designed for assessment. *Simulation & Gaming*, *27*, 110-122.

Wolfe, J. (1994). Recollections on 25 years of simulation/gaming. *Simulation & Gaming*, *25*, 274-278.

Wolfe, J., & Crookall, D. (1998). Developing a scientific knowledge of simulation/gaming. *Simulation & Gaming*, *29*, 7-19.

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