DECISION SUPPORT FOR STRATEGIC UNIVERSITY MANAGEMENT: A DYNAMIC INTERACTIVE GAME

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The main objective of this research is to construct an interactive dynamic simulation model, on which a range of problems concerning the academic aspects of a university management system can be analyzed and certain policies for overcoming these problems can be tested. More specifically, the model focuses on long-term, strategic university problems that are dynamic and persistent in nature, such as growing student-faculty ratios, poor teaching quality, low research productivity. The model generates numerous performance measures about the three fundamental activities of a university, namely, teaching, research and professional projects. To construct such a game, a systemic feedback model of the major academic aspects of a university system is built. The model consists of 12 sectors: Graduate Instruction, Undergraduate Instruction, Graduate Instruction Quality, Undergraduate Instruction Quality, Graduate Faculty Instruction Overhead, Undergraduate Faculty Instruction Overhead, Graduate Faculty Research, Undergraduate Faculty Research, Graduate Faculty Projects, Undergraduate Faculty Projects, Laboratory Facilities and Assistants sector. (Figure 1. displays stock-flow structure of Graduate Instruction sector as an illustration. The reader is referred to Diker 1995 and Barlas and Diker 1996 for more information and other sectors.) The model is calibrated using data from Bogaziçi University-Istanbul and the dynamic behavior patterns of the model are found to be consistent with the major historical time patterns obtained from Bogaziçi University. Observing the results of these tests, it is concluded that the model is structurally and behaviorally acceptable. (See for instance, Figure 2. and Figure 3). Simulation experiments with graduate versus under-graduate study orientation shows that graduate study orientation has considerable positive effect on research output. In other experiments, assuming different desired under-graduate class sizes reveals that keeping class sizes extremely low, under the condition of high student body may cause serious problems in maintaining the faculty body, because of decreasing faculty supply and increasing number of faculty members as a result of heavy instruction loads.

Next, the necessary changes were made on the model to construct the interactive gaming version and the gaming interface was programmed using Vensim/Venapp. (See Eberlein and Peterson 1994). The main screen of the game is shown in figure 4. (See Diker 1995 for detailed information). A group of players with different academic degrees and orientations played the game and their game results were compared to explore the capabilities of the interactive gaming version of the model. (See Figure 5. as an illustration). The comparison of the game results of the players revealed that players with different orientations emphasized different performance measures.

Results reported so far are part of an ongoing research project. At this stage, we can state that the simulation model and the interactive game have proven to be a useful laboratory to support not only practical debate, but also theoretical research on how to best deal with strategic university management problems. We are currently in the process of identifying and initiating further research on the existing model and the gaming interface. The model can be extended to include more aspects of the university system, such as budget considerations, support staff and in general more detailed representations of variables such as facilities, infrastructure and projects. Also, the gaming interface can be enhanced to include various new features. Another research extension would be to build different versions of the game, each emphasizing different aspects of the university management system.

REFERENCES:

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Diker, V.G., 1995, *An Interactive Dynamic Simulation Model of a University Management System*, M.S. Thesis, Institute for Graduate Studies in Science and Engineering, Bogaziçi University.

Eberlein, R.L. and Peterson D.W., 1994, "Understanding Models with Vensim", *Modeling for Learning Organizations*, (Ed: Morecroft, J.D.W. and Sterman, J.D.), Productivity Press, OR.

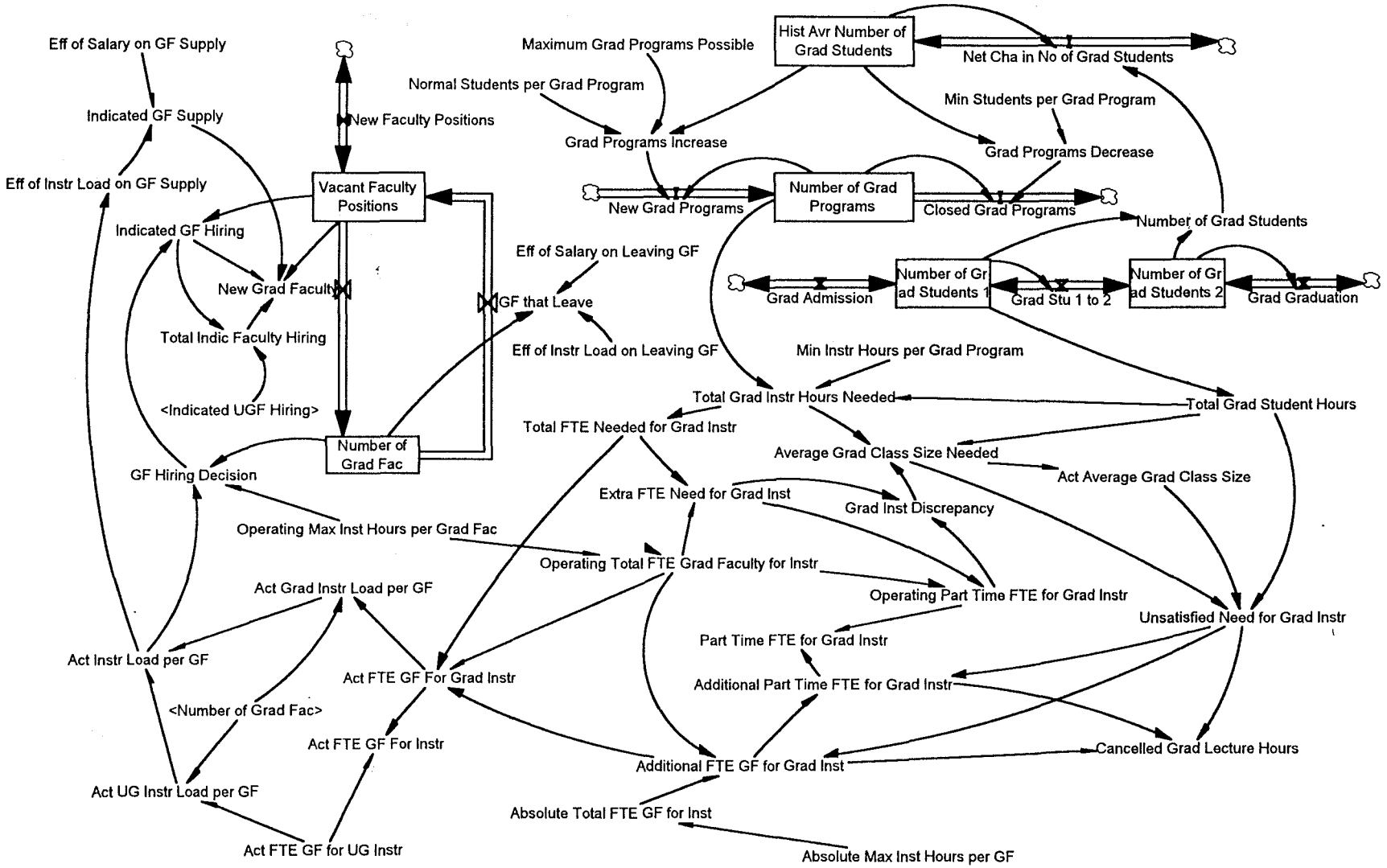
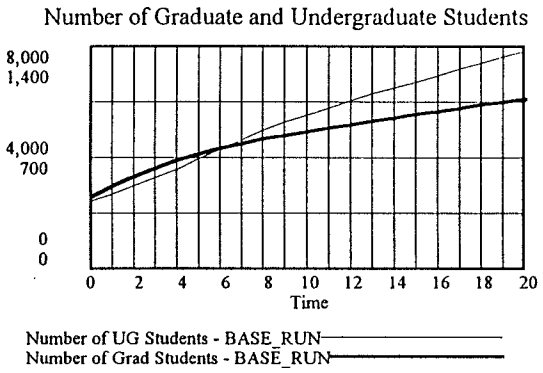
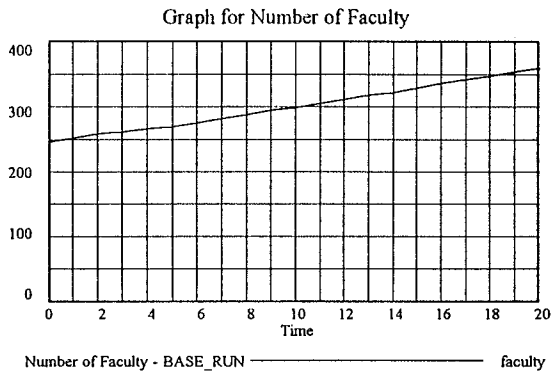


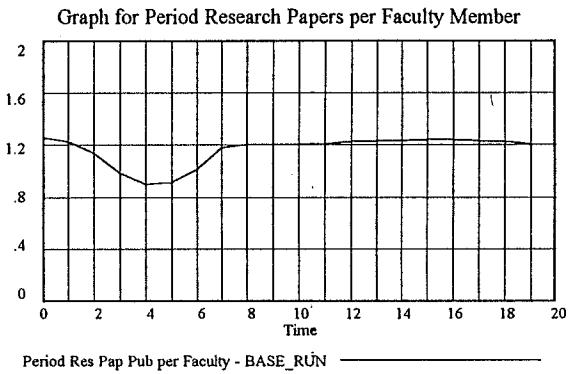
Figure 1. Stock-Flow Diagram of the Graduate Instruction Sector.



The Dynamic Behavior of Number of Students in the Base Run

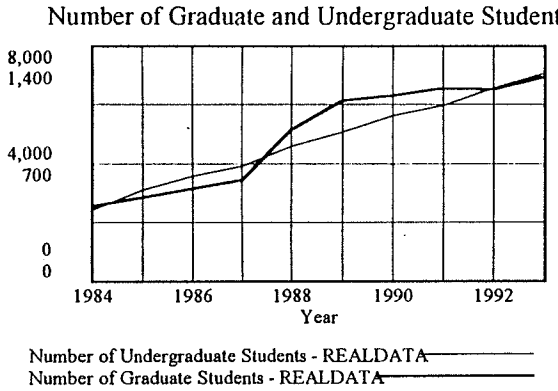


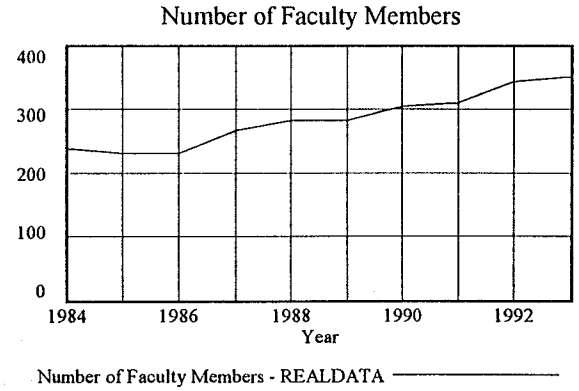
The Dynamic Behavior of Number of Faculty Members in the Base Run



The Dynamic Behavior of Number of Research Papers per Faculty Member in the Base Run

Figure 2. Output Behavior of the Model in the Base Case.





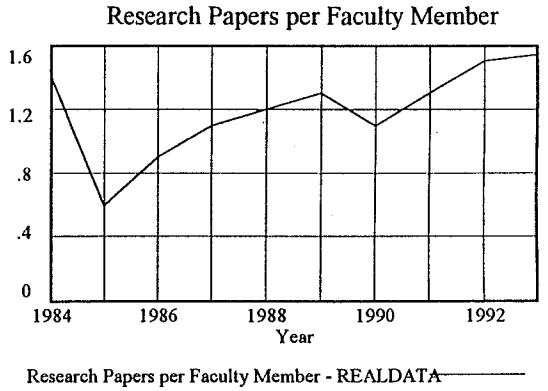


Figure 3. Real System Behavior According to Data from Bogaziçi University

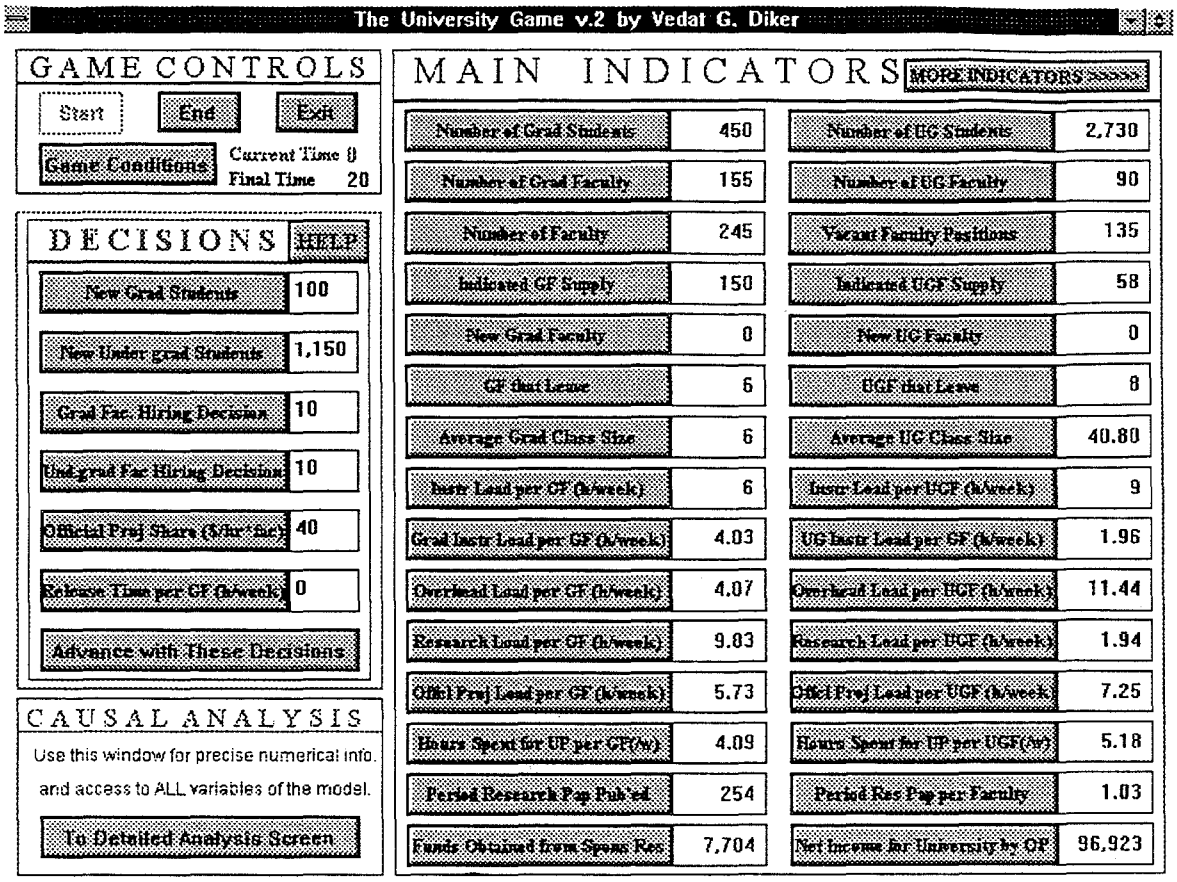


Figure 4. Main Screen of the Interactive University Simulator

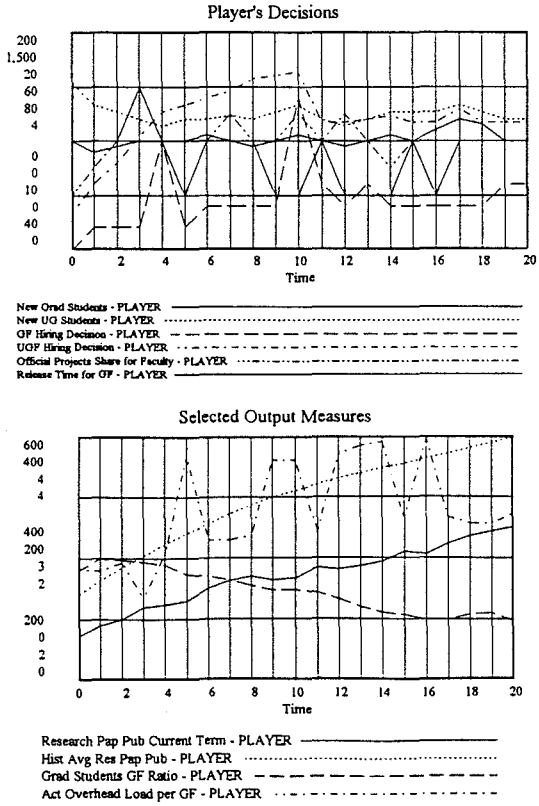


Figure 5. Decisions and Selected Output Measures from a Game Session