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COMPUTER-ASSISTED GAMING OF INTERNATIONAL BUSINESS

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ABSTRACT

Considering that a *nation* is definitionally a governmental entity, the issues critical to an international business gaming-simulation must be governmental issues, namely, monetary, fiscal, and trade policies. A gaming-simulation can represent issues either by modeling them or by gaming them. The gaming method assures validity and avoids administrative error. Its administrative difficulties can be relieved by computers. Forms for presenting national accounting statements and methods for computing currency exchange rates and national measures of welfare are discussed. A minimum class size limitation of 20 participants is acknowledged and one application is presented. Continued development of the gaming method may depend on the acceptance of gaming-simulations as ideal instruments for assessing business education.

INTRODUCTION

With the increased internationalization of business and the recommendations of Porter and McKibbin (1988) for more coverage of the international dimension in the business curriculum, business schools have been extending their international-business offerings and game designers have been including an increasing number of international-business issues in top management business games. Yet, little has been published about the kinds of issues that should be represented in such games, and even less, about methods for representing them. Although Klein, Fleck, and Wolfe (1993) listed 19 issues they characterized as critical, later reduced by Wolfe (1994a) to 16[1] in a related article, the list was not developed from fundamental considerations, but derived from a content analysis of four international-business textbooks and the index of Ingo and Murray's (1988) *Handbook of International Business.* Fundamental reasons for characterizing issues as critical to international business were not discussed.

Yet, to create an effective international business game, the designer needs both a fundamental basis for distinguishing between critical and incidental issues, and a concept relating the method of representing an issue to its educational consequences. Without a basis for distinguishing among issues, the complex game that includes more may be uncritically accepted as better, a problem noted earlier by Fraser (1983) and more recently by Hall and Cox (1994). Without a concept relating method to consequences, ineffectual methods may be seen as adequate. Thus, in Klein, Fleck, and Wolfe's (1993) comparative review of six international top management games, those that included more selected international issues and included them more elaborately were simply assigned higher critical-issue scores.

This paper discusses how issues critical to international business can be differentiated from incidental ones. It points out two different methods for elaborately treating issues, and shows how national accounting statements, currency exchange rates, and national measures of welfare can be computed when international business issues are treated by the gaming method. By setting forth principles of international business gaming, this paper extends the body of research on the design of business gaming-simulations that has been pioneered by Goosen (1981).

ISSUES

Definition differentiates critical issues from incidental ones. Issues defining a construct are critical; issues frequently associated with a construct are merely incidental. In the context in which international business is discussed, a *nation* is definitionally a governmental entity.[2] Accordingly, the critical issues for an international business game must be governmental issues, especially those that directly affect the conduct of business.

By this consideration, six of Wolfe's (1994a) issues are incidental rather than critical, namely, comparative advantage, imperfect competition, socio-cultural factors, intracompany transfer pricing, technological

[1] The 1 6 issues are comparative advantage, national and international growth and development, trade protectionism, imperfect competition, direct foreign investment, exchange rate fluctuations, offshore sourcing, differential inflation rates, socio-cultural factors, intracompany transfer pricing, technological transfer, nationalism, hedging, political risks, value-added taxes, and patent/license agreements.

[2] Alternative definitions of the term, *nation,* that encompasses a people sharing customs, origins, and history, such as a tribe of Native Americans, fall outside the usual context.

transfer, and political risks. These issues are important to geographically dispersed businesses, irrespective of whether or not the businesses cross national boundaries. Thus, businesses in Hawaii, Mississippi and New York differ on these issues, even though the businesses lie within a single nation.

METHODS

Klein, Fleck, and Wolfe (1993) rated gaming-simulations on the elaborateness of their coverage of each issue on a four-point scale, with zero points assigned to no treatment; one point, static treatment; two points, exogenous administrative treatment; and three points, endogenous dynamic treatment. An issue was considered to receive exogenous administrative treatment if it "could be influenced exogenously by administrative intervention during the simulation's run" (p. 167). It was considered to receive endogenous dynamic treatment, if moreover, players interacted "with the simulation's model or other simulated companies" (p. 1 67). The possibility of gaming, wherein players in one rose interact with players in a complementing role, was not recognized. Yet, as Crookall, Martin, Saunders, and Coote (1986) have pointed out, this possibility "has greater scope and potential than other types when social and socially mediated processes and skills are seen as important learning outcomes" (p. 370).

A gaming-simulation can treat an issue in an endogenous dynamic way either by modeling the issue or by gaming it. When modeled, participants supply inputs that a computer translates into outputs; when gamed, participants supply inputs that other participants translate into outputs. Although more complicated models can account for dependence among participants that less complicated ones do not, modeled decisions do not embody the intelligence and affection of human decisions in a natural way, notwithstanding Patz's (1990) suggestion to apply artificial intelligence, which was not implemented.

The difference between modeling and gaming can be seen clearly in the way different gaming-simulations treat product demand. Modeled, the simulation computes a company's demand based on the decisions of the company, with or without reference those of competing companies. Gamed, the simulation does not compute demand, rather it executes the purchasing decisions of participants who buy the company's products. In this instance, the company's demand is an unquantified concept encompassing the collective intelligence and affect all participants who can purchase the company's products, as it is in the everyday world.

Likewise, the governmental issues defining an international business game can be either modeled or gamed. To model tariffs, for example, the computer, acting as the government, might adjust tariffs depending on the condition of one or more firms; to game it, participants might, by voting on the tariffs they want, cause the tariffs to change.

Modeling's primary advantage is ease of administration; it's primary pitfall, invalidity. Because everyday relationships are almost invariably much more involved than any programmed algorithm, participants who respond to the model as if it were real may perform less well than those who, ignoring the substantive issues modeled, merely play to the model. Furthermore, as Bankes (1993) has noted, "the belief that the more detail a model contains, the more accurate it will be . . .. is false in that no amount of detail can provide validation, only the illusion of realism" (p. 439).

Gaming, on the other hand, assures validity[3] by representing issues genotypically. Like a chemical reaction in a test tube, the gamed process is characteristically real, even though it occurs in a controlled environment. Although gamed processes can be difficult to administer and difficult to design, the techniques and an application discussed below will show that computers can relieve much of the administrative burden and reduce the design problem to a one-time concern.

THE GAMING METHOD

Gaming the governmental issues critical to international business implies that players be allowed to change the monetary policies (e.g., interest rates), fiscal policies (e.g., tax rates and entitlements), and trade policies (e.g., subsidies and tariffs) that affect their firms. If the changes are to be decided by a democratic process, then players ought to be involved in the interplay of special interests that typifies such processes. Thus, if tariffs are to be so

[3] *Validity* as used herein refers to correctness of representation, and not to pedagogical efficacy, which involves questions of internal, external, and transfer-internalization validates as discussed by Burns, Gentry, and Wolfe (1990). Inasmuch as the pedagogical efficacy of a textbook is immaterial until the correctness of the text is established, likewise, the pedagogical efficacy of a gaming simulation is immaterial until its correctness of representation is established.

decided, players ought to be concomitantly involved with its effect on consumer welfare, on resource cost, and on product revenue. Such involvement is possible in a game that allows players to be consumers as well as producers, that is, to assume multiple roles.

Games that require participants to assume multiple roles are generally difficult to administer, and especially so in college settings. The method for assigning roles must be accepted by participants as fair, and the mechanism for tracking the performance of each participant must be reliable. The fairness requirement can be met if roles are self-assigned and if each participant is allowed simultaneously to assume all roles. The reliability requirement can be met by a computer system running well-tested software. These are doable requirements.

Moreover, the game should supply participants with vital economic information. These include national accounting statements, currency exchange rates, and national measures of welfare. The method for computing these numbers should derive from their economic definitions and correspond with the way these numbers are obtained in the everyday world, but how it should be done in a gaming-simulation setting has not heretofore been discussed.

National Accounting Statements

In an international business game, national accounting information vital to governmental decision-making should be reported in a form that can be readily comprehended. Although no standard national reporting form exists that is comparable to corporate accounting's financial statements, national reporting forms that disaggregate information into the income, balance, and fund flow categories of corporate accounting should be the easiest to comprehend, especially by business students. Examples of reporting forms that may be suitable are given in Tables 1 through 3, respectively.

In the example of Table 1, base exports (first item) is the ex-subsidy value of exports, base imports (third item) is the ex-tariff value of imports, net investment (seventh item) is the sum of all companies' productive assets net of depreciation, and retained income (second to last item) is the cumulative retained earnings of companies. Relationships are as follows:

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NEx = BEx + ExSub - BIm - ImTrf          (1)
(800 = 2,000 + 200 - 1,000 - 400)
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NDP = Cons + NInvs                       (2)
(6,200 = 5,000 + 1,200)
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NNP = NEx + NDP                          (3)
(7,000 = 800 + 6,200)
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DirCl = PInTx + CInTx + PtFee            (4)
(154 = 100 + 50 + 4)
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DirPy = Ent + IntPy                      (5)
(110 = 100 + 10)
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DisIn = NNP - DirCl + DirPy - RInc       (6)
(6,876 = 7,000 - 154 + 110 - 80)
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TABLE 1
NATIONAL INCOME

Base Exports (BEx)	$2,000
Export Subsidies (ExSub)	200
Base Imports (BIm)	1,000
Import Tariffs (ImTrf)	400
Net Exports (NEx)	800
Consumption (Cons)	5,000
Net Investment (NInvs)	1,200
Net Domestic Product (NDP)	6,200
Net National Product (NNP)	7,000
Personal Income Tax (PInTx)	100
Company Income Tax (CInTx)	50
Permits and Fees (PtFe)	4
Direct Collections (DirCl)	154
Entitlements (Ent)	100
Interest Payments (IntPy)	10
Direct Payments (DirPy)	110
Retained Income (RInc)	80
Disposable Income (DisIn)	6,876

Table 1 reports *net* (after depreciation) national product, rather than the more well known *gross* national product, because the net value is a more correct measure of economic strength and because the value of depreciated assets in a gamed economy can be known with precision. The difficulty of measuring depreciation in the everyday world that leads to the preferred use of gross measures is nonexistent in a game.

For the national balances of Table 2, relationships consist of totals only. Personal money and company money are the sums of personal and company cash balances, respectively; output inventories and resource inventories are sums of company output and resource inventories, respectively; and personal loans and company loans are the sums of direct governmental loans to participants and companies, respectively, assuming that financial intermediaries, such as

commercial banks, are omitted from the game. For more complex games, a detailed breakdown of some items, such as breaking down resources into raw materials, work-in-process, and fixed assets, may be desirable.

For the national fund flow of Table 3, relationships are as follows:

TABLE 2
NATIONAL BALANCES

Personal Money	$2,500
Company Money	1,000
Total Money	3,500
Output Inventories	800
Resource Inventories	200
Total Inventories	1,000
Personal Loans	400
Company Loans	500
Total Loans	900

TABLE 3
NATIONAL FUND FLOW

Balance of Trade (BalTrd)	$1,000
Dividend Inflow (DivIn)	100
Capital Inflow (CapIn)	200
Total Inflow (TIn)	300
Dividend Outflow (DivOut)	200
Capital Outflow (CapOut)	300
Total Outflow (TOut)	500
Balance of Payments (BalPay)	800

BalTrd = BEx - BIm (7)
(1,000 = 2,000 - 1,000)

BalPay = BalTrd + TIn - TOut (8)
(800 = 1,000 + 300 - 500)

Currency Exchange Rates

Currency exchange rates in much of the everyday world are established by foreign exchange markets that are useful principally because perfect information about holdings of foreign exchanges does not exist. In a perfectly informed world of two nations, for example, knowledge that Nation A holds $2 of Nation B's currency, and that Nation B holds $1 of Nation A's would lead to the exchange rate of two B$'s for each A$. In this case, the correct rate of exchange would be perfectly clear.

Because a gamed economy is in fact perfectly informed, correct currency exchange rates can likewise be computed by taking the relative proportion of each nation's exchange currency to every other-a market for foreign exchange would be superfluous. For example, if both Nation A and Nation B each began with $3 million in exchange currency, if subsequently Nation A sells $1 million worth of goods to Nation B, then Nation A's exchange currency will drop by $1 million, which went to pay the exporter, and Nation B's exchange currency will rise by $1 million, which was received from the importer. As a result, the exchange rate will be A$2 million for B$4 million, that is, each A$ will now be worth two B$'s.

National Measures of Welfare

The unemployment rate and the consumer price index are two well-accepted measures of economic welfare. Both measures can be computed for a gamed economy wherein participants assume multiple roles, in correspondence with their everyday-world counterparts.

If the gamed economy allows each participant to be employed voluntarily in one or more employee roles, then the unemployment rate *(U)* can be computed, given the number of employed roles *(N_e),* the number of participants *(Np)* and the number of employee roles assumable by each participant *(Nr),* as follows:

$$U = 1 - \frac{N_e}{N_p N_r} \quad (9)$$

For example, if the game is played by 40 participants, each of whom can assume 3 employee roles (i.e., work in three jobs simultaneously), and if of these 1 20 employable roles (i.e., 40 participants times 3 roles each), 96 are occupied, then the unemployment rate will be 20%.

As for the consumer price index, if the gamed economy gives participants performance points in relation to the products they consume, then the consumer price index can be computed by averaging the price per point of consumer purchases. For example, if alphas are worth 4 points each and beta's are worth 6, the purchase of 2 alphas for $100 each and 3 beta's for $200 each would result in the expenditure of $800 (i.e., 2 x $100 + 3 x $200) for 26 points (i.e., 2 x 4 + 3 x 6), or a price index of $30.77 a point (i.e., $800 ÷ 26).

CLASS-SIZE LIMITATION

Class size may be the most severe limitation of an international business game designed around the gaming method. Because such a game must have at least two nations, because each nation should have at least two companies, and because each company should be managed by at least two participants, the absolute minimum class size will be 8 (i.e., 2 nations times 2 companies times 2 participants). To allow for the anonymity essential to arms-length market transactions, however, the practical minimum may be about 20 participants.

AN APPLICATION

The adequacy of a design is not assured without a tangible application. The concepts discussed herein were applied in designing GEO (1 994), an international business superset of DEAL (1994), an entrepreneurship gaming-simulation. GEO is a completed, classroom-tested product.

With reference to the 1 2 characteristics Klein, Fleck, and Wolfe (1994) used to compare international business games, GEO can be characterized as follows:

1. Number of Products: Five.
2. Product Type: Configurable by the instructor to be generic or particular, in any combination. Manufactured and service products are both allowed.
3. Home Office: Configurable by the instructor to be generic or particular, but participants must be assigned to two to four nationalities.
4. Active Subsidiaries: None for companies, but participants can simultaneously be shareholders and directors of up to five companies, and be employed by up to three.
5. Expansion Options: None for companies, but each participant can found up to five companies.
6. Minimum No. of Decisions: 44.
7. Maximum No. of Decisions: 148.
8. Manual Length: 42 pages.
9. Companies per Industry: 32,767 companies.
10. Computer Type: IBM PC local area network.
11. Decision Support Materials: A chronological transaction database complemented by a sales analysis program.
12. Time Recommended for First Decision: One hour.

Largely because GEO was based on the gaming method, its characteristics are very different from those of the six games reviewed, all of which were based on the modeling method. In number of products (Item 1), GEO's five is more than the one or two of the others. In product type (Item 2), GEO's is completely flexible, a result made possible by incorporating a special multiple-industry scheme (Thavikulwat, 1993). In home office assignment (Item 3), the required assignment of participants to different nationalities is a consequence of its gaming principle. In active subsidiaries and expansion options (Items 4 and 5), its minimal flexibility for companies but maximal flexibility for individual participants is consistent with its consumption orientation (Thavikulwat, 1990). In minimum and maximum number of decisions (Items 6 and 7), its numbers are relatively high, but comparability is limited because it processes decisions interactively and immediately while the others all collect decisions for batch processing. In manual length (Item 8), its 42 pages is shorter then the others, which range from 58 to 1 52, because GEO contains no complicated models requiring extensive explanation. In companies per industry (Item 9), GEO's 32,767 companies allow for a virtually unrestricted number, but in computer type (Item 10), GEO's local area network is more demanding than the others, which are not designed for simultaneous runs by participants. In decision support materials (Item 11), GEO can make available a database of transactions because activity in GEO is based on transactions, and not on models. In time recommended for first decision (Item 1 2), GEO's one hour is remarkably shorter as compared with the others, which range from 6 hours to 16 hours, because GEO does not require teams to be organized before decisions can be made. GEO is very different from the others in most of the characteristics.

Moreover, GEO is apparently unique among business gaming simulations in automating a system that allows participants to change the monetary, fiscal, and trade policies of their assigned nations by voting. It does this by presenting each participant with a voting form, an abbreviated version of which is shown in Table 4. The first three items of the example involve monetary policies; the next three, fiscal policies; and the next ten, trade policies. The last item, Vote Increment Rate, is the rate an item will change when the number of participants voting for the change exceed an instructor-determined Vote Decision Ratio, which is not shown.

TABLE 4
ABBREVIATED EXAMPLE OF A VOTING FORM

VOTE-USA		USA	Japan	+	=	-
Deposit Interest Rate		0.0100	0.0100	3	4	2
Loan Interest Rate		0.0200	0.0200	0	9	0
Overdraft Interest Rate		0.0300	0.0300	0	9	0
Personal Tax Rate		0.5000	0.5000	0	9	0
Company Tax Rate		0.5000	0.5000	0	9	0
Entitlement	$	1,000	1,000	0	9	0
Subsidy Rate, Service		2.0000	2.0000	0	9	0
Subsidy Rate, Material		4.0000	2.0000	0	9	0
Subsidy Rate, Energy		2.0000	4.0000	0	9	0
Subsidy Rate, Machine		2.0000	2.0000	0	9	0
Subsidy Rate, Food		2.0000	2.0000	0	9	0
Tariff Rate, Service		2.0000	2.0000	0	9	0
Tariff Rate, Material		2.0000	4.0000	0	9	0
Tariff Rate, Energy		4.0000	2.0000	0	9	0
Tariff Rate, Machine		2.0000	2.0000	0	9	0
Tariff Rate, Food		2.0000	2.0000	0	9	0
Vote Increment Rate		0.200	0.200			

In the example of Table 4, the “USA” and “Japan” columns give the policy settings currently in effect for the two respective nations; the “+“ column, the number of USA nationals who have voted to raise that setting; the “=“ column, the number who have voted to maintain it; and the column, the number who have voted to lower it. As shown, 3 USA nationals have voted to raise the deposit rate; 4, to maintain it; and 2, to lower it. Given a Vote Decisive Ratio of .50, the current deposit rate in the USA will rise from 0.100 to 0.1 20 when 5 or more USA nationals, out a total USA population of 9, vote to raise it. Should that happen, the 5 or more votes in the “+“ column will be moved into the “=“ column while the votes that were in the “=“ column will be added to those in the “-“ column.

CONCLUSION

This paper covers the basic problems of gaming international business. It pinpoints the governmental issues that should be covered in a business game that professes to be international in scope. It notes the differences between the gaming method and the modeling method, and it shows how national accounting statements, exchange rates, and national measures of welfare can be obtained with the gaming method. It acknowledges the method’s minimum class size requirement of 20 participants. And it describes characteristics of one application in comparison to six others that had been reviewed.

The gaming method for representing issues is different in kind from the modeling method that has been the mainstay of business gaming-simulations since its inception. Uncommon in association with computerized business simulations except as incidental features accompanying optional scenarios, the method is well-known to the wider gaming community and is variously referred to as computer-assisted simulation (Crookall, Martin, Saunders, & Coote, 1 986) and external simulation (Hazleton & Mahurin, 1986). Business game designers, however, generally have relied on modeling methods to such an extent that Wolfe (1994b), a long-time user of business games, has concluded that “the simulations being used today are not that much different from those created in the late 1 950s” (p. 276) and that “the basic discovery phase of business gaming has ended” (p. 277).

The gaming method does require better computational hardware and software to manage its higher administrative demands, as compared to other methods. But as long as business games are viewed as merely a supplemental teaching pedagogy of limited value, sufficient financial remuneration’s will not be forthcoming to support the method’s development. The method is in search of a mission, or in the parlance of the computer world, of a killer application. The movement for assessment in higher education may supply the application. Should assessment in business education become accepted as essential, business gaming-simulations based on the gaming method may be seen as the ideal instrument for the purpose. In which case, the discovery phase of

business gaming may yet continue for many more years.

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