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DEVELOPMENT OF MANAGEMENT SKILL ASSESSMENT

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ABSTRACT

The problem of management skill assessment by games is analyzed in the frame of a suggested model to explain some recent 'strange' experimental results.

MANAGEMENT SKILL ASSESSMENT BY GAMES

1. In the problem of **Management** Skill **Assessment by Games (MSAG)** *given* a business game G and some competitors C1, C2, Cm competing in G it *is required* to select a criterion K and competition assessing methodology M such that ordering of the C1, C2,...,Cm in accordance with (K,M) would be isomorphic to the ordering with respect to the "Management Skill Assessment Standard Methodology'.

2. To advance in solving the MSAG problem it is necessary to interpret and explain some concepts.
First, what does *"Management Skill Assessment Standard Methodology* " mean? In general, we do not know the answer. The current state of that important question and ways for its investigation are outlined in A*nderson, Lawton-97]*. Until its complete resolution we, like many others, are replacing that methodology by common recommendations of MBA colleges. For our purpose *it is enough to suppose that there exists such standard methodology* to interpret its syntax in our model.

Second, a competitor C competes in accordance with one of available control *programs* which determine possible ways of its behavior. We suppose that during the competition each competitor selects one of the programs and keeps it unchanged. For that reason a *competitor in each competition is identified by its current program.*

Third, competitors perform allowed actions, or make *moves,* from corresponding sets **Al, A2,..., Am** simultaneously step by step in T periods. We refer to a vector of such actions as a *bundle of actions.* Bundles of actions transform the initial situation S into sequences of new situations.
A tree of all sequential bundles of actions of competitors from initial situation S in T periods we name *S-game tree,* or *S-tree.*
In fact S-tree is the sum of performance trees of the competitors' programs starting from S. The whole performance of the programs may be described by the forest of such trees from different initial situations. To avoid technical complications in definitions later on we suppose to have only one initial situation.
We name the performance of a competitor C i.e. representation of its program , in S-tree as a *complete S-strategy of C.*
As a graph a complete S-strategy of C is a subtree of the S-tree where the actions of C are indicated for all possible situations emerged from S.
Any subtree of a complete S-strategy of *C* with root situation P we name *P-strategy of C.* We also use terms a *strategy of C, a strategy,* etc.
Forth, at the MSAG problem level of approximation we perceive each manager as a unchanged program representing him during the competition. As a consequence of that supposition we must accept that the management skill assessment problem is reduced to the evaluation of the performance of the corresponding program.
Because the performance tree of a competitive program C in a S-tree is a S-strategy the *Skill*

Assessment Standard Methodology may be interpreted as some criterion that is tested on a given S-strategy to evaluate its quality. Let us denote that criterion as SASM and *suggest* that its value is determined by terminal nodes of S-strategies. For example, it may be the average profit gained by S-strategy and calculated by averaging the value of the profit for all of its terminal nodes. *Thus, if we measure SASM for each S-strategy of the Cl, C2,..., Cm and order them correspondingly we will get 'the ideal* ", *or 'desirable* ", *ordering of managers in accordance with their skills, or SASM-ordering.*

3.How could we get the ideal SASM-ordering of competitors using SASM criterion and business games tournament approach of assessment? Given criterion K and methodology M we play a series of games from Initial situations to order competitors CLC2,. . .,Cm in accordance with their performances. Since any game from initial situation S corresponds to appropriate terminal nodes in Strategies of Cl,C2.. . .,Cm. the series of games will be represented by corresponding sets of terminal nodes of these strategies.

Thus, in order to obtain SASM-ordering all nodes of all strategies must be estimated. It is possible as a result of robin-round tournament where each competitor must meet with all possible (m-1) bundles of all possible strategies of (m-1) competitors. The results of such tournament may be represented by (m, N) matrix where N is equal to the number of all (m-1) combinations of strategies of the sets of possible strategies of competitors.
It is evident that *even for moderate values of the above parameters that estimation is a computationally difficult problem.*

4. Let us see how we actually order managers (players) in games like MARKSTRAT2. When we try to order C 1 ,C2 Cm in accordance with series of their game performances we actually try to approximate the ideal ordering of the strategies based on the above complete analysis of their terminal nodes by some partial analysis. Even in the case of using SASM criterion we may obtain different orderings of the strategies due to the insufficient amount of analyzed terminal nodes.

Thus, it becomes evident that we have to substantiate the acceptance of our approximation and estimate the level of its correctness.
One of the reasons why experiments in [Anderson, Lawton, ABSEL-97] did not reveal any positive correlation between standard management skill assessment criteria and the ones used in business simulation may be the absence of the estimation of the necessary set of games of participants to obtain acceptable approximation.

5. Since SASM-ordering of competitors based on their game performances. or tournaments, is a computationally hard problem, the question of appropriate constrains becomes actual to reduce the complexity.
For a symmetric problem of the evaluation of the effectiveness of management strategies in [*Pogossian, ABSEL-* 97] the criterion of knowledge based "essentially improvable" strategies was formulated allowing to advance in the efficient evaluation of strategies. The criterion may be applied to games like Value War [*Chussil, Reibstein, 94*] where strategy search simulation is used to predict results of oligopoly competition for consultancy purposes.
Because that criterion seems natural and acceptable for managers, we study its application for management skill assessment purpose.

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