MANAGEMENT

Games Managers Should Play

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Call it "revenge of the nerds", if you like, but many high-school chess-club presidents are landing the most coveted strategic-planning positions at major corporations. Chess players realise that good strategic decisions require taking into account the likely moves and countermoves of other players. They study their competitors' approach to the game, and identify the likely sequence of moves that will follow any particular move they make. By looking forward and reasoning backward they make moves that drive the game toward a checkmate victory.

Looking Forward and Reasoning Backward

This ability to look forward and reason backward is enormously valuable to strategic decision-makers in the business world. When building a new chemical plant or paper mill, profitability often turns on whether competitors also choose to add capacity. The success of new marketing or pricing strategies depends on whether or not competitors replicate these strategies. In fact, it is hard to identify a strategic decision in oligopoly markets that is not influenced by the retaliatory countermoves it sets off. The best business strategists must be skilled at predicting future rounds of competitive conduct.

This is easier said than done. Significant uncertainty often surrounds competitive conduct, and many managers simply assume *status quo* competitor behaviour or make some other educated guess. But such assumptions can be dangerous. Managers unwittingly set off value-destroying price wars, get buried by aggressive retaliation from incumbent players in markets they attempt to enter, and cannibalise their own core markets because they either ignore or make the wrong guess regarding competitor reactions.

The good news is that game theory provides a structured process that can help managers make better strategic decisions when faced with uncertainty about competitive conduct. Game theory is not new—economists, mathematicians and political scientists have been developing it for over 50 years. What is new is the increased emphasis on using game theory as a practical strategic decision-making tool for real-world managers. For example, most participants in the recent US personal communications services spectrum auctions hired game theorists to develop their bidding strategies. And my colleagues and I at McKinsey & Company have developed a systematic game-theory process that has been successfully applied in over a hundred client engagements in the past few years.

Defining the Business Game

A good game theorist gets inside the heads of other players in the game to understand their economic incentives and likely behaviour, focusing on five key elements of competitive intelligence:

• *Define the strategic issue*. What decision are you trying to make—pricing, capacity, market entry—and how is it related to other strategic decisions being made in the market? For example, if you are trying to make a capacity investment decision, it is vital that you understand if others in the market are also considering market entry or exit decisions.

• *Determine the key players in the game*. Which players' actions will have the greatest impact on the success of your strategy? A common mistake is to assume that all your strategy games are *against competitors*, and that there is always a winner and a loser. But many of your strategy decisions turn on the actions of other players in the market—suppliers, distributors, complementary-goods providers—and "win-win" outcomes are attainable. For example, a computer hardware manufacturer attempting to stimulate demand for its product must focus on the economic incentives of software producers to provide products consistent with its operating system; a thorough understanding of these incentives allows the hardware producer to structure contracts, joint ventures, or alliances where both parties are better off.

• *Identify the strategic objectives of each player*. It is common for "textbook" game theorists to assume rational, profit-maximising objectives for the players. In real business games, however, players often base decisions, at least in the short run, on criteria like market share or growth. It is extremely important to get this right. If you choose to enter a new market assuming the incumbent players are profit maximisers, when in fact they are driven primarily by short-run market-share objectives, you might suffer unexpected losses when the incumbents slash prices to maintain their market shares.

• *Identify the potential actions for each player*. For each of the key players in the game, including yourself, develop a list of potential actions they might take on the strategic issue. Generate this list from the perspective of the other players, and not just your own. What options might your competitors be considering, and how will they evaluate these options? You should not automatically assume that your competitors have the same set of strategy options that you do. Competitive role-play exercises involving external experts and your management team can help generate these lists.

• *Determine the likely structure of the game*. Are decisions going to be made simultaneously in isolation or sequentially over time? If sequentially, who is likely to lead and follow? Will this be a one-shot decision, or will it be

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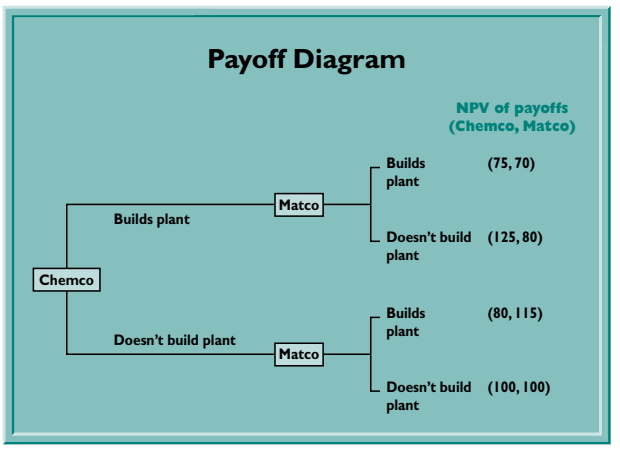
repeated? Most business games are repeated, sequential games—for example, pricing decisions are made in sequence over and over again in most markets.

These five elements of competitive intelligence define your business game, but more work is generally required before such information can be used to "solve" the game. A thorough industry economic analysis—including market research and competitor cost and capacity estimates—is usually required to estimate the payoffs to different players, given their strategic objectives, from following different strategies. This information is summarised in a *payoff diagram*. The accompanying figure is an example of a payoff diagram. It can be used to guide strategic decision-making.



Solving the Game

The figure is based on a real-world duopoly chemical market case. The two competitors, call them Chemco and Matco, are each deciding whether to build a new plant. It is unclear which player will make its capacity-addition choice first, but the decisions will certainly be made sequentially—for simplicity, this diagram assumes that Chemco moves first. Each has long-term profit maximisation objectives, so that the numbers in the payoff diagram represent net present value (NPV) calculations. For example, if neither builds a new plant each player is expected to earn an NPV of 100.

Chemco should look forward and reason backward to determine its capacity addition decision. If Chemco builds a new plant, the payoffs suggest that Matco will choose not to build a plant; Matco will earn an NPV of 80, and Chemco will earn 125. However, if Chemco decides not to build the plant, then Matco should choose to build a plant instead; Matco will then earn an NPV of 115, and Chemco will earn 80. The diagram shows that it is profitable for one new plant to be built in the industry, but that two new plants will lead to significant excess capacity, deep price discounting, and lower expected profits for both players. What strategic insights should Chemco take out of this simple exercise? First, it illustrates the first-mover advantage in the game—by committing to new plant capacity before Matco, Chemco can influence Matco's incentives to build and avoid the dismal outcome where both players bring on new plants. This exercise also illustrates the symmetry of this first-mover advantage. Matco similarly has incentives to move first, suggesting that Chemco must *credibly commit*—perhaps through real bricks and mortar—to new capacity as soon as possible. In addition, it demonstrates how important it is for both players to understand the limited prospects for growth in the market. If Matco erroneously believes the market can profitably support both new plants, its capacity-addition plans will not be influenced by Chemco's commitments to build.

Game Theory is Useful for Managers

Many business games are more difficult to define and solve. In fact, this duopoly chemical case was in reality more complicated since capacity decisions were repeated over time, and Matco and Chemco competed across a broad range of product lines. Some economists even argue that real-world business games are so complex, and their solutions are so sensitive to model assumptions, that game theory is irrelevant for business decision-making. I disagree. First, there are a surprising number of oligopoly strategy problems that can be modelled as simple, quantifiable games—pricing, capacity management, marketing, new entry, bidding, and contract design problems are particularly common in our work at McKinsey.

Second, game theory applications need not identify unique, robust "equilibrium" solutions to be valuable strategic decision-making tools. The process itself—by forcing managers to think explicitly about the incentives and likely moves of other players—can generate breakthrough strategic insights even when the game cannot be explicitly modelled. I have seen qualitative role-play exercises and other structured game-theory discussions generate enough insight to lead to a change of direction on new entry, capacity addition, pricing, and other fundamental strategic decisions.

Third, and perhaps most important, while attempting to model the current industry game, managers invariably develop insights on how to *change the game* to drive more favourable outcomes. Unlike board games like chess, the rules, players, and potential moves in business games are not given. While game theory can help you play your current game better, its greatest value often comes from helping players define new games. For example, in some cases game theory predicts that current market conditions make price wars highly likely because customers switch easily between competitors. The current game modelling exercise identifies the need to change the game by implementing customer loyalty programmes, such as frequent-flyer discounts, that create value for customers and decrease incentives for destructive price competition.

I encourage you to apply game theory the next time you need to make a strategic decision where competitive interactions matter. Look forward and reason backward to generate insights on how to play your current business game better. At the same time, make sure you leverage these insights to define better games to play. If you do not change your game to gain advantage, you can bet one of your competitors will. And there is little value in being the best chess player around when everyone else is playing checkers. ◆