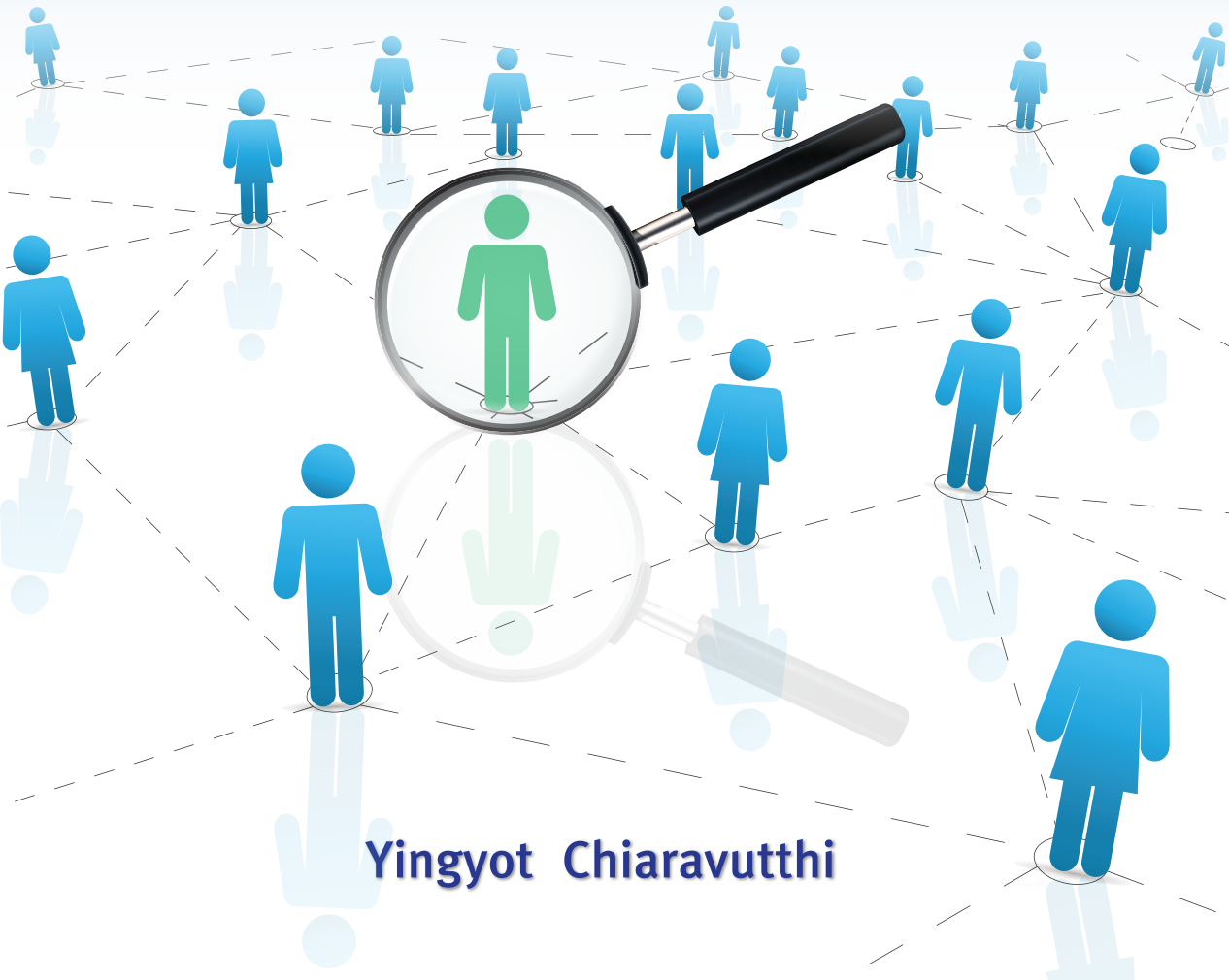
Mahidol University Press

Behavioral Game

Experiments in Thailand,

and Implications of
Cross-Country Comparisons



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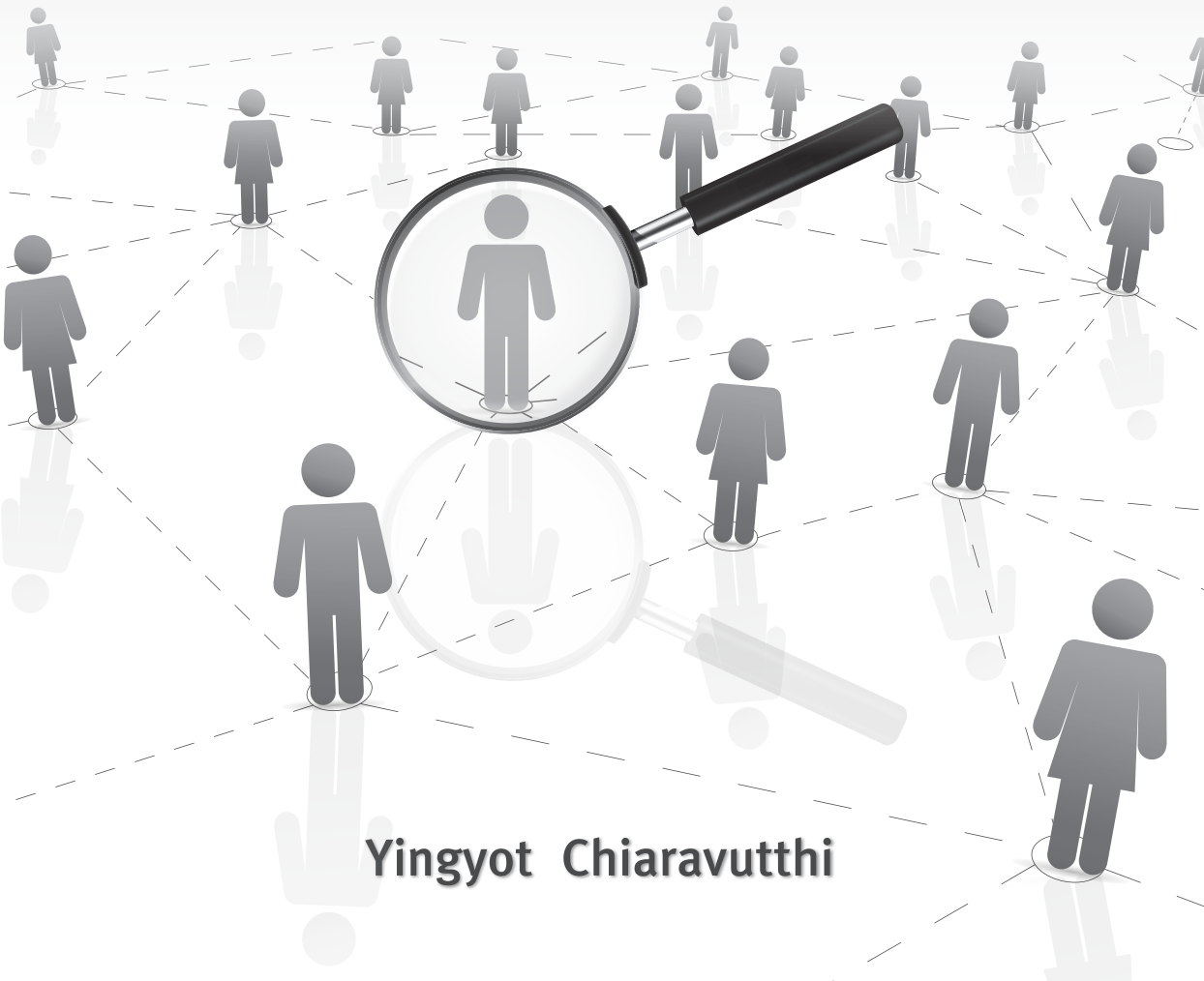

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Forward

Dr. Yingyot Chiaravutthi does an excellent job in providing undergraduate and graduate students, and well-educated members of the pubic, with a conceptual framework that will lead to a better understanding of the complexities of game theory and behavioral economics, as seen in a cross cultural context. He also helps to explain the cultural variant's impact on the theoretical tenets of game theory. A significant contribution of his work to the academia is, by basing his experiments on Thai subjects, in a Thai context, and presenting a comparative perspective. In this regard, I consider his work on the subject of game theory and behavioral economics to be original. I appreciate his exceptional contribution, and strongly recommend this book to students and also the general public.

Associate Professor Dr. Somjai Phagaphasvivat
Independent Scholar

As I have studied and practiced in both areas of finance and economics, I have come to realize that these two subjects are closely related. It could be because these two areas share some basic fundamentals of consumers' rational expectations, insatiability, risk-averseness and other characteristics. Those fundamentals, together with the utility theory, are the basis of many ideas and theories of conventional finance and conventional economics. However, in the real and practical world, we often observe unexplainable phenomena that goes beyond the capacity of the existing conventional theories. That is when behavioral economics and behavioral finance have to be applied

I am familiar with "Behavioral Finance" which is often used to explain unexplainable financial problems via traditional theories, and am also in the process of tackling "Behavioral Economics". Fortunately, during my recent discussions with Dr. Yingyot, my view of "Behavioral Economics" has been broadened. He talked about the methodologies and let me read the manuscript of his book "Behavioral Game Experiments in Thailand, and Implications of Cross-Country Comparisons" which is about to be published.

The concept and contents of this book are exceptional and inspirational. The text is well-written and well-structured with clear explanations, making it simple for both young economists and advanced professionals alike, as well as the general public. The insights will certainly become one of the best books, a 'must' to read. Dr. Yingyot conducted a number of real experiments with groups of participating students from Mahidol University International College. The research poses interesting questions and challenges the conventional economic theories. The conclusions from each game, such as the Prisoner's dilemma game, the Ultimatum game, the Dictator game, and others, clearly explain why some unexpected results are encountered in the real world. Furthermore, Dr. Yingyot compares the eight Thai experiments with the results of findings in other parts of the world, thus providing an insightful understanding of a range of cross-cultural behaviors.

I would like to express my heartfelt appreciation and congratulations to Dr. Yingyot Chiaravutthi for his outstanding research work, which will be of great benefits to readers and society as a whole.

Assistant Professor Santi Kiranand, DBA
Executive Vice President
The Stock Exchange of Thailand
Dean
Faculty of Business Administration, Rangsit University

This book is about the study, research, and applications of "game theory", which is an attempt by human to try to understand their own behavior. Generally speaking, economics since Adam Smith has followed the assumptions of the market mechanism (the playing field of a game) which consists of several buyers and sellers. As such,the effect of an action or decision of a single individual (whether a buyer or a seller), has little or no consequence and is similar to that of a small stone thrown into a lakeor ocean. Nevertheless, in many cases, the market or the playing field of a game has only a few "players" who can be easily identified. In such cases, any decision will certainly affect the decisions and actions of the others. Consider a battlefield where the military generals are designing their strategies, players have to guess how the other players will "make their moves". The decisions or actions of one person or "player" will affectthe decisions or actions of other personsor "players", and eventually shape the game's outcome. It is obviousthat "game theory" is interesting, fun, and has substantial benefits; since it can be applied to many branches of knowledge, fields of study, and situations. Many familiar words thatwe often encounterin our daily life have their roots from "game theory", such as "zero sum" or "win-win situations", to name just a few.

When Dr. Yingyot wrote this book in the context of Thailand and Thai people, and as such it is extremely valuable. A majority of the research on game theory has originated from abroad, particularly in the West; and it is therefore necessary to conduct additional studies and research in the context of other countries, in order that cultural comparisons can be made. The findings of the research in the book are stimulating and profound, and serve as a motivation for more studies and research. It is my hope that this will be a book that everyone chooses to read. It contains knowledge, it is written in easy-to-understand wording and is directly to the point from the first page until the last.

Waitune Pokachaipat
President
TRIS Corporation Limited

Preface

The book is composed of selected "behavioral game" experiments which have been widely employed to assess human behavior. These experiments have been conducted in different countries to test whether humans behave according to the theory, and whether those behaviors vary across cultures. However, previous studies have relied mostly on subjects from developed countries, particularly the United States and those in Europe. A few notable exceptions were experiments conducted in China and Russia. What have been missing are experiments on Thai subjects; and that is the motivation behind this book. The specific experiments presented in the book were carried out in Thailand, and the results were compared to existing findings. A background in introductory microeconomics is not required, although it may provide the readers with a quicker understanding of the materials.

Although the content is mostly related to the field of behavioral science, the book is not intended to be a required text for a specific course, but rather to be used as supplementary reading for several courses at the undergraduate and graduate levels, particularly for the degrees in business administration or economics. Possible areas of focus would be international business courses, specifically in the context of cultural comparisons and sensitivities. The results from the experiments clearly show that people from different countries do behave differently. The book could also serve as extra reading in a course related to cultural studies or cultural management. It may also be part of a traditional microeconomics class, an applied microeconomics class, a game theory class, or a behavioral economics class, in which the lecturer would like to introduce deviations from economic predictions. Or it could be useful for an experimental economics course or research methodology course focusing on the topic of experimental techniques, since each chapter provides a detailed description of how each game is actually conducted in the laboratory. It should be noted that one major benefit of

experimental methodology is the ability to repeat the experiment with other pools of subjects; and therefore, the instructions of the experiments in this book have been made available upon request.

Each chapter is structured similarly; starting with the nature and the expected outcome of the game itself, followed by how to actually conduct the experiment, the raw results of the game conducted in Thailand, and comparisons of the results to other existing research. As for the sequence of the book chapters, the Prisoner's Dilemma Game is first, since it provides a good introduction to game theory prediction, and actual behavior in the laboratory. The Ultimatum Game has a long history, and has been utilized around the world. It also serves as a basis for subsequent games namely, the Dictator Game, the Investment Game, and the Public Good Game. The Market Competition Game and the Corruption Game are quite unique, and are discussed in the last two chapters.

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Acknowledgements

Running an experiment is costly, so running several experiments places a heavy financial burden on the researcher. All the experiments described in this book were funded by a Mahidol University International College (MUIC) Seed Grant, for which I am very grateful. Eight students from the Master of Business Administration Program at MUIC assisted me in conducting the experiment during 2011 and 2012. Each ended up writing a thematic paper on one game, in part fulfillment of their graduation requirement. They are, in alphabetical order, ChonladaThanamahamongkhol (the Ultimatum Game I); Kajornsiri Auimanachai (the Investment Game); Kaweephun Yothinnorratham (the Competition Game); Kong Ek-Ak (the Public Good Game); Sukhum Macharoenrungrueang (the Corruption Game); Thamarat Timim (the Prisoner's Dilemma Game); Tunyapach Narkwachra (the Ultimatum Game II); and Warathip Chanthadamrongrat (the Dictator Game). Their contributions have played a major part in the success of this project. MUIC executives, particularly Prof. Maleeya Kruatrachue, offered me their strong support and encouragement; as did my colleagues in the BusinessAdminnistration Division, even at the last minute. I have been blessed to have Prof. Elisabet Rutström as my dissertation advisor, as she was the person who introduced me to the world of experimental economics. This book project has actually taken longer than I originally anticipated. During the process, it also substantially affected my so-called "family time", and I would like to express my thanks and appreciation to my family for their understanding. Although the book has met the author's intentions; if there are any errors, I admit full responsibility.

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1 Introduction to Behavioral Games

Chapter 1
Introduction to Behavioral Games

Behavioral Economics

Life is not a one-way path, instead it is full of choices. For most of the choices we encounter on a daily basis, we can reach a decision in a spontaneous manner with or even without our realization. However, not all choices are simple; interactions among people warrant that many choices could affect or be affected by others, which in turn complicate the consequences of those choices. For example, when students are assigned group work, they choose to be either a free rider or a committed team member. When there is only one television in the living room, family members argue over which channel to watch; and when firms in the same industry compete together, decisions have to be made about raising or lowering prices, or launching new products.

Economists rely on one important assumption underlying decision making, situations namely that all individuals are "homo economicus". This term refers to an individual who behaves according to economic predictions. That individual is rational, and is motivated solely by his/her self interest. Decision making is driven by profit maximization in the case of firms or satisfaction (or utility) maximization in the case of individuals. In that sense, behaviors are easily predictable since emotions do not play a major role. As such, it would seem pointless for us to give money to impoverished strangers, when we cannot expect to see any tangible return from such behavior. For firms, they can be expected to terminate jobs during an economic downturn, in order to cut costs.

However, the assumption of rationality and self interest has been challenged over the past decades. Mullainathan & Thaler (2000) argue that actual human behavior does not strictly follow the economic model's prediction, rationality does have its limitations. Even with access to full knowledge and information, people often lack self control; eating and drinking the wrong things without

considering the effects on our health, for example. In addition, people do not always act selfishly. It is hard to imagine a society, in which self-regarding behavior is prevalent. People do care for others, and many behaviors are driven by altruism, which is why people make donations to charitable organizations, even though it may mean that they have less money in their wallets by the end of the month. People also trust their friends, colleagues, neighbors, and sometimes strangers, even in situations where there is a chance of losing out. Many people are concerned about fairness, and are willing to forget about their personal interest in order to compensate those who have been treated unfairly. People might also put in a lot of time and effort in punishing those who took advantage of them, when the consequences of such retaliation do not benefit them financially. In situations where someone treats us nicely, we reciprocate back without thinking about our own self interest. The field of behavioral economics has more or less emerged from these observations. It focuses on the contrasts between the economic and psychological models, and early researches in this field have identified anomalies in the economic findings (Camerer & Loewenstein, 2004).

The so-called "other-regarding" behaviors also have several business implications. In a society where people display a strong sense of fairness, firms may be reluctant to set a profit-maximizing price. For example, firms may decide not to raise price during a supply shortage, in fear of a backlash from potential buyers. Laying off workers may also be difficult in such a society; in which the employment contract between employer and employee has to be based on fair treatment, rather than on the firm's profit. During a business negotiating process, gaining an advantage over a potential partner who comes from a society with a low level of trust, and who has a strong reciprocity requirement, would be very challenging. On the other hand, a society with a high level of trust could result in lower costs of doing business, and cooperation amongst firms in such a society may be a lot easier.

Experiments across Countries

Economists prefer to analyze individuals' (or firms') interactions in a "game" setting, which involves participants or players making choices. This book presents eight simple games which have been tested under the experimental method. These games were originally developed for the purpose of confirming the economic prediction, rather than rejecting it. However, evidence from the experimental results generally did not support such a prediction, and have revealed insights actual human behavior that these games have been referred to as behavioral games as well.

In recent years, experimentation is one of the most widely used methods in testing economic theory. Experiments allow researchers to focus on one or a few specific factors at a time, without the influence of other factors. Incentives are usually provided to those participating, usually money, so the results are less subjective. Experiments allow researchers to directly observe the behaviors, and measure the intensity of those behaviors. Not only that, because the researchers have almost full control in these laboratory situations, the experiments can also be replicated by other researchers in order to validate the experimental designs and results (Davis & Holt, 1993).

Initially, these behavioral games were undertaken by participants in the same country; and, in most cases, at the same university. Although economists tend to believe that every individual is motivated by the self-interest principle; it seems evident that "other-regarding" behaviors are universal across cultures, although not necessarily with the same intensity. To test this hypothesis, these games have actually been replicated by other researchers, relying on participants or subjects from other cultures. This book focuses mainly on subjects from Thailand, and their performances in participating in these behavioral games.

Replications of the experiment across countries are not easy to undertake. Several issues arise, which could invalidate comparisons of the results. Roth, Prasnikar, Okuno-Fujiwara, & Zamir (1991) discuss some of the potential problems of cross-country experiments.

Many experiments require the experimenter to be present in the laboratory, in order to personally conduct or run through the required steps. If the game is played in different locations and with different experimenters, the "experimenter effect" could pose an issue when cross-country results are judged. In the case of Thailand, this would also be an issue, since all the experiments presented in this book were conducted by the author and his assistants. In order to solve the "language effect" problem, the instructions and the documents employed in the Thai experiment were translated from English to Thai language, and then from Thai back to English language to ensure consistency. Lastly, the "currency effect" is a major issue when countries have different purchasing power. The author set the average compensation at 500 Baht for those participating in one session of the experiment. This rate is almost equivalent to two day wages in Thailand, which could be considered quite high compared to other similar experiments conducted in other countries. The main reason for this was to ease the problem of low participation rates amongst Thais. The comparisons presented in this book should take these points into consideration. Further replications of these experiments with different samples of Thai subjects would also prove valuable.

Equilibrium Prediction

When a game involves more than one player and all players are required to make decisions, their choices define the final outcome of the game which affects the well being of each other. This final outcome is formally called "equilibrium" in economics. This section provides an introductory background on the equilibrium concept, in which experienced readers may choose to skip.

When an economics student is asked what equilibrium means, the usual answer given is that it is where the demand of a product is equal to its supply, similar to the example given above. This usual response is not entirely wrong, but it is limited to the equilibrium in a market. For the purpose of illustration, consider a market of a particular product where there are three buyers (A, B, and C) and one seller. Within a certain time period (maybe

one week), each buyer would like to purchase only one unit of this product; while the seller is able to produce only two units during this short period of time. The three buyers have different preferences and willingness to pay for the product. Assuming firstly that buyers A, B, and C are willing to spend 110, 100, and 90 Baht, respectively, for this product; and secondly that the cost of producing each unit is very small. As a result, both units will be sold to the highest bidders, namely A and B. If the seller is allowed to set one price for both units, that price would have to be 100 Baht, which is the equilibrium price. If the seller sets the price higher at 105 Baht, he will sell only one unit, and if he sets the price lower than 100 Baht, he will still sell the same two units but at a cheaper price. He can earn more money by keeping the price at the equilibrium, because at the equilibrium, the seller's behavior does not change.

In the broader sense, equilibrium is the state where related participants do not change their behavior, so that state is said to be stable. Consider another example of two firms (A and B), both competing in the same market. Assume each of the two firms face the same two choices or strategies, which are to launch a product with new technology or continue with the old technology. The condition is that no firm will win the game if both firms offer the same technology, since no one will have a competitive edge over the other. But if both adopt different technologies, the one with newest technology will be the winner. This requires both firms A and B to give some thoughts to the other firm's decision choice. For example, if firm A decides to choose the new technology, firm B will have to choose between the old and new technology. The outcomes to firms A and B depend on their choices, as illustrated in Figure 1.1.

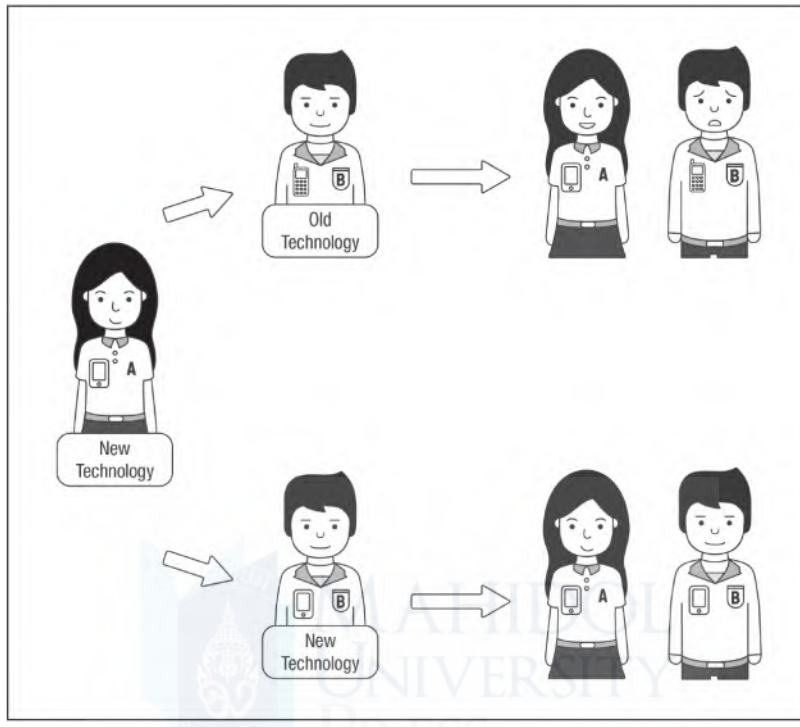

Figure 1.1: Example of the choices and outcomes of the game

Formally, the strategies and outcomes of this game can be illustrated in the "payoff matrix", as shown in Figure 1.2, in which there are four possible outcomes of this game. When both firms choose the new technology, there is no clear winner in this market, and each firm could end up sharing half of the market. Also, when both firms stay with the old technology, there will be no winner and no loser. However, if both firms choose different technologies, the one that chooses the new technology could win a major share of the market, whilst the other could witness a sharp decline in their market share. Being the winner is most preferable outcome, followed by there being no winner, whilst being the loser is the worst outcome.

	B: New technology	B: Old technology
A: New technology	B: No winner A: No winner	B: Loser A: Winner
A: Old technolog	B: Winner A: Loser	B: No winner A: No winner

Figure 1.2: Possible outcomes of the game

In order to find the equilibrium of this game, all possible scenarios have to be considered. If firm A introduces the new technology, firm B can offer either the new technology (resulting in no winner) or the old technology (and becoming a loser). Since no winner is better than being a loser, firm B will launch the new technology; as illustrated in Figure 1.3, by an arrow pointing towards that choice. By using this logic with the other possibilities; eventually four arrows will be drawn.

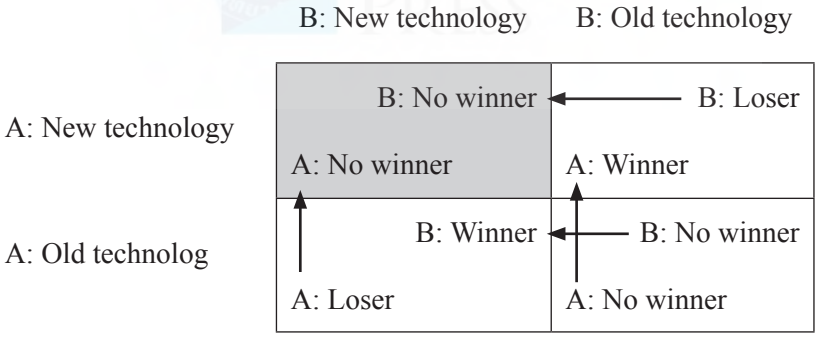

Figure 1.3: Equilibrium of the game

Equilibrium is the outcome that has two arrows pointing towards it, and here it is where firms A and B both choose the new technology, as shown by the shaded rectangle in Figure 1.3. Since this equilibrium outcome contains two arrows, it implies that both

firms A and B make this choice, after having considered the other firm's behavior. Other rectangles are not equilibrium since they either receive one or no arrows. Consider the case where firm A chooses the new technology, whilst firm B elects to keep the old one; this outcome receives only one arrow, since it benefits only firm A. Firm B is the loser, and can only be better off if it adopts new technology. Because firm B changes its behavior, it is not a stable situation and therefore cannot be the equilibrium.

This equilibrium is also referred to as the Nash equilibrium, named after John F. Nash Jr., a mathematician who initiated this concept, and earned the Nobel Prize in Economic Sciences in 1994. Other more complicated games could involve more than 2 players, and more than 2 strategies. Some games may have more than one equilibrium, or none at all. In fact, the equilibrium may not necessarily be definite. Players could actually "mix" two or more strategies in the equilibrium. Readers interested in learning more about this topic should refer to other books on microeconomics or game theory.

Several games do not require players to make their decisions simultaneously. A game can be sequential, in which one player makes their choice before the other player. For example, if firm A chooses new technology first, firm B has to decide whether or not to offer the new or the old technology. Figure 1.4 presents the "extensive form" of a sequential game. There are still four possible outcomes of this game. But to find the equilibrium, the last stage has to be the starting point. The reason for this is that all of the stages of the game are known to both firms, which means that firm A realizes that after it has made its decision, it will be firm B's turn. As a result, firm A has to think ahead regarding firm B's future behavior. As for firm B, its decision is conditional on firm A's choice. For example, if firm A offers the new technology, it is better for firm B to also offer the new technology. But when firm A offers the old technology, it would be better for firm B to offer the new technology. Now, let us turn to firm A's decision. Since firm B will always end up being better off introducing the new technology, firm A should choose to introduce the new technology first.

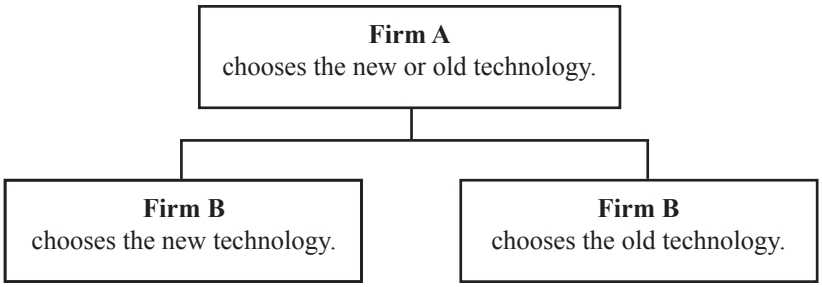

Figure 1.4: The extensive form of the game

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