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APPLICATIONS OF GAME THEORY IN BUSINESS DECISIONS

Monograph

Lithuanian Institute of Agrarian Economics

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To write a monograph about Game Theory encouraged the following reasons: first of all, the lectures "Game Theory and it's practical application" have been the most interesting for the students during the whole cycle of delivered lectures, secondly, analytical information in different languages on this topic is not so common, not in Lithuanian language at least, and thirdly, the authors wanted to test how widely companies in Lithuania have applied the principles of Game Theory in their daily activity and how beneficial they have been for the business. This monograph should be of interest for the representatives of business world, young people, who study social sciences (and not only!) and it also targets people, who are into such phenomenon as negotiations, business transparency, the meaning of emotions in decision making and the game itself. Of course, this monograph is not about gambling literary, but about the game essence of which is to get direct/indirect benefit from the choice of Game Strategy in all situations.

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INTRODUCTION

"Business is co-operation, when you need to make a pie, however, when the time has come to share that pie, it turns to a competition."
Kippenberger (1998)

Many people are willing to give the negative connotation to the notion "game" since a game relates to wasting of money, earned through hard work, borrowing and many other financial and psychological problems. According to classical Economics view, a game, like buying lottery tickets, gambling, betting and other is treated as irrational behavior of individuals since the chance of winning a game is smaller than losing it. However, per Kumar (2009), the need for playing a game is in a human's psycho. It is believed that this need is conditioned by various biological, psychological, religious, and socio-economic factors (Brenner, 1983: Walker, 1992; Doukas Zhang, 2013). The player is the most important subject and initiator of a game. He seeks to decide, thinking rationally, what would enable maximizing expected benefit in a specific situation. Usually there are more participants than one in a game, who all together thinking rationally, seek to maximize the returns.

The authors of this monograph seek to present the importance of Game Theory in making business decisions, practical and scientific application of Game Theory. Interest in contemporary Game Theory and its practical application, as a part of Behavior Economy, is rapidly growing in the world, however it was found no scientific or fiction literature on how to make business decisions in Lithuania, applying Game Theory. Recently we notice the increase of Nobel prize winners, who have researched the named area. In 1994 J.C. Harsanyi, J. F. Nash and R. Selten were named as the beginners of non-cooperative Game Theory, who have first earned the Nobel prize in Economy, in 2005, the developers of cooperative game R. J. Aumann and T. S. Schelling have also been one of the winners of Nobel prize. In 2012 two more scientists, who researched Game Theory and Behavior Economy, have joined the colleagues: L. S. Shapley and A. E. Roth. It is noted, that the trend of Game Theory in Lithuania is not totally new and is mostly associated with the scientist E. Vilkas and his students.

The game rules are established to determine the functions of all players in a game, meaning that it is agreed in which principle the game will go on and what actions of the players are allowed or not allowed. Even though the rules of a game are established with the agreement or initiative of the players, they are obligatory, which means the players are obliged to keep to them and follow them if they want to take part in a game. The ignorance of the game rules is treated as cheating.

Knowing the game rules, players choose the most acceptable tactics for them, for example, one player can seek to gain advantage against other players, take risks or be cautious.

Traditionally, the rules are clearly defined in all games. The rules in business are various law, requirements, principles, within which the business is functioning. A contract is signed to determine the relationship and interaction between the business subjects (for example business relationship with providers).

The main goal of a game is to choose such tactics, which would justify monetary/survival expectations of a player. In this context, the decision to play makes people to manipulate actual resources and try to maximize the chance of winning, appropriately choose game partners and decide, whether to act on his/her own. The game in its essence is a certain behavior, how to make a decision in risky conditions. However, is a game always the decision, made through irrational behavior? Probably it is so in non-professional market. Random, non-professional players mostly count on success. However, according to Chapman and Getzen (2011), professional players first of all gather data, analyze it, set the probability of winning the game in order to make an optimum game behavior decision in risky conditions. Based on this approach, a game becomes the outcome of rational behavior, based on mathematics and statistics. Due to this reason, the decisions, based on Game Theory, are made in business acquisition, repurchasing, applying pricing strategies, making business connections with partners, forming investment portfolio, taking part in procurement.

According to Kippenberger (1998) any business strategy is a complex phenomenon. It is so not only because the strategy covers the decisions of business direction and a wide spectrum of possible outcomes. Some strategies, especially those, which change the direction of business activity from the essence or form the whole economic activity directions, are designed by people, who are business leaders and have a great insight. Appropriately chosen business strategy helps to create and maintain the value of goods and services in the market. However, the value added and its maintenance processes are very different. The creation of value is the process of co-operation, when one business cooperates with other businesses in order to create value through the sale of goods and services, whereas the maintenance of value is a process of competition, when one business tries to sell own goods and services in such way, that they would have as much value as possible for the consumers in comparison to similar products in the market. All in all, the aim *to create* and *maintain* value raises a dilemma for the business leaders whether to choose co-operation or competition. Contemporary business relationships are mainly formed based on competition approach, which means, that competition is power, which can provide the business with competitive advantage or

make the business loss. However, outsmarted competitors are willing to respond likewise and destroy all benefit, which has been created using primary strategy. In other words, competitive strategy "winning-losing" ends up with the result of "losing-losing". Due to this reason, it is meaningful to analyze and understand the strategic decisions, which would enable to optimize value creation and maintenance processes in business. Game Theory principles can effectively contribute to these processes, therefore the authors of this book will analyze and present the practical application of Game Theory principles.

The application of Game theory principles in business have been widely analyzed within the following aspects in scientific literature: the opportunities of competitive co-operation between business subjects (Gnyawali et al., 2006; da Costa et al., 2009; Bengtsson et al., 2010; Brandenburger, Nalebuff, 2011; Gnyawali, Park, 2011; Jadlovska, Hrubina, 2011; Myerson, 2013; Bengtsson, Kock, 2015; Alves, Meneses, 2015), the establishment of leadership in the market (Timothy, 2013), the structure of game negotiation (Dixit, Nalebuff, 2008; McCain, 2014; Bono, Wolpert, 2014), business acquisition cases (Schneider, Spalt, 2010; Shaoluo et al., 2011; Agarwal, Zeephongsekul, 2013; Douk, Zhang, 2013), creation of alliance motives and modelling their activity (Arend, Seale, 2005), also the creation of co-operation and partnership of infrastructure principles (Eriksson, 2007). What is more, the assumptions of Game Theory are applied for the management of logistics researches in business (Arora, 2012; Reyes, 2006), researches of economic and financial decision making (Barberis, Huang, 2008; Baker et al., 2009; He, Zhou, 2011; O'Connor et al., 2014), creation and management of business risk strategy researches (McVea, Charalambu, 2014; Sahin et al., 2009; Schmidt, Zank, 2008; Nilsson et al., 2011; Liu at el., 2014; Samsura, van der Krabben, 2012; Amato et al., 2015) and assessment of business intellectual capital and knowledge sharing researches (Chen, 2003; Chua, 2003; Ho et al., 2009; Carayannis et al., 2014).

In 2012 Nobel prize winners in Economy, representatives of two scientists' generation and scientific research directions, L. S. Shapley and A. E. Roth, have demonstrated, that Game Theory and its practical results are possible to match, and it is not necessary to research those two aspects together. Despite the independent scientific activity, L. S. Shapley's general co-operative game sharing stability theory related to, and supplemented with empirical researches, simulation experiments of behavior and practical decisions of market design, performed by A. E. Roth. Actually, the representative of second generation, A. E. Roth has also referred to L. S. Shapley's developed theory, especially Gale-Shapley distribution algorithm. This has encouraged the development of a new research generation and allowed to improve the effectiveness of market activity significantly, even when ordinary market power fails and is not able to control the choice of people, for example, the choice of school graduates where to study further or perform

internship, the choice of marriage or organ donation. Experience do not end up in laboratories, the results and conclusions are widely used even when the creators of algorithms are not totally aware of this.

However, the main problem, which remains always, when the game theory principles are applied in business, despite the business area or problem, which is chosen for the analysis, can be formulated the following: **which game must be chosen now**?

One of the first scientists, who mentioned the need to choose the right game, were Brandenburger and Nalebuff (1995) in their study about the creation of business strategy. The authors have assumed, that the players can co-operate, compete and model, which incorporated co-operation and competitiveness has been called *co-opetition*. However, later studies (Johannessen, Olaisen, 2008; Jadlovska, Hrubina, 2011; Luzzini et al., 2012; Machina, Viscusi, 2013; Doukas, Zhang, 2013; McCain, 2014; Rengifo et al, 2014; Pahlke et al., 2015 and other) have identified that co-opetition model, created by Brandenburger and Nalebuff (1995) cannot fully explain, which business game must be chosen in every situation, when conflict of interests arises. Therefore, this monograph seeks to analyze the application of Game Theory aspects in business in depth.

1. CLASSICAL ASPECTS OF GAME THEORY

Structurally analyzing big systems such as business, often such situations like conflict of interests, between multiple participating subjects, arise. Even though the efforts to find an optimum problem solving method are made, which could be suitable for one of the subjects, it often limits the possibilities of other subjects to achieve their expected results. Such fight of contradictions could be noted in many situations and connections within subsystem of a huge system, like relationship with service providers, competitors or employer and employee relations in business. In order to find the solution, which would totally meet the needs of all participating subjects, the scientists suggest to count on the principles of Game Theory. A game is treated as the model of conflict situations, which are idealized and artificially created. They are meaningful, because of the rules, which are established in every game, even though they can be modified with an agreement of all participating subjects. What is more, certain criteria exist in a game, which allow to evaluate situations though the point of view of all subjects. *The essence and main concepts of Game Theory, analysis of business network structure, the relationship of Game Theory with decisions, made in uncertainty conditions and the application of Game Theory in business, through the review of scientific researches, will be provided in this chapter.*

1.1. Essence of Game Theory

Taking into consideration a huge level of uncertainty, Game Theory is considered to be a method, which is appropriate to use, when making an optimum decision in an uncertain situation. The beginners of modern Game Theory are considered to be Zermelo (1913) and Borel (1921), even though the theoretical concept on Game Teory has been produced by John von Neumann and Oskar Morgenster in their work "*Theory of Games and Economic Behavior*" which was published in 1944. Other researchers of this theory are the winners of *Nobel Peace Prize* in 1994 such as John Nash, John Harsanyl and Reinhard Selten. The principles of Game Theory are close to the principles of "conflict analysis" (Hirshleifer, 2001; Pawlak, 2005; Cheldelin et al., 2008; Speakman, Ryals, 2010; Mikkelsen, 2013; Gee, 2014, Temirkulov, 2014 and other) and "behavior decisions theory" (Hansson, 2005; Trommershauser et al., 2008; Yukalov, Sornette, 2011; Drechsler, Becker, 2013; Alexander et al., 2014; Kumar, Goyal, 2015 and other) because Game Theory analyzes possible ways of solutions and behavior aspects of interested parties in conflict situations. The most of Game Theory models have been derived from mathematical background in various social sciences, such as Economy and Politics (Myerson, 2013; McCain, 2014).

Game Theory makes a great impact on the strategic thinking, the following scientists have researched this phenomenon (Kipperberger, 1998; Arend, Seale, 2005; Gonzaga, 2006; Da Costa et al., 2009; Jadlovska, Hrubina, 2011; Myerson, 2013; Amato et al., 2015 and other). They declare, that the application of Game Theory in business, can explain the strategic success and loss of the business. As noted by Kippenberger (1998), "The companies, which chose to compete alone and compete till the end, they destroy all the pie, without leaving any value. Such companies, which create a pie, but are not able to retain its value, harm themselves" (p. 23).

Game Theory is denoted as the composition of mathematical models, applied by rationally thinking and decision making people, for the analysis of different situations, conflict, and co-operation (Myerson, 2013). It means, that the game is treated as the conflict of interests between two or more subjects, when searching for an optimum decision, which would satisfy the needs of all participating subjects. The goal of decision making in a conflict situation, which are made by the management leaders of businesses, is to find the way of problem solving (da Costa et al., 2009), which would satisfy the interests of conflicting parties, even though the needs of those parties remain opposite (Jadlovska, Hrubina, 2011).

The supporters of Game Theory try to understand the conflicts of subjects and situations of co-operation through the analysis of quantitative models and hypothetical examples. Such examples in most cases can be viewed as simple, however the simplicity makes the main aspects of conflicts and co-operation more understandable. Based on Game Theory, people, who make decisions, must choose such a strategy, which would allow to achieve the equilibrium of interest and assure the best possible results in a specific situation. It is noted, that the strategy in Game Theory is interpreted in a different way than it is usually done in business environment. This has been proved by the empirical research of the authors, which has been explained in further chapters.

The interpretation of a strategy in traditional business environment and in the case of Game Theory application' comparative analysis is presented in Table 1.

As seen from Table 1, the goals of strategies in traditional business environment covers broader range than in the case of Game Theory application. Strategies in traditional business environment help to achieve raised goals, retain and increase the competitive advantage and also effectively use resources, develop competencies and form relations with other subjects in business environment (consumers, suppliers) (McCain, 2014).

Table 1. Interpretation of strategy in traditional business environment and in case of Game Theory application

Comparative factors	Strategy in traditional business environment	Strategy in case of Game Theory application
The goals of a strategy	To create the tools in order to achieve the goals of business, to retain and increase the competitive advantage and create the tools for the effective usage of business resources and the development of competencies, to form relations with other subjects of business environment.	To retain competitive advantage of business, to form relations with other subjects of business environment.
The content of a strategy	Setting long-term goals, distribution of priority resources, the choice of business nature within the activity of the company, setting different levels of management, implementation of decision models, definition of strategic intentions, investment into resources to develop and retain the competitive advantage of the business.	The search and usage of company's advantages, implementation of decision models, the definition of interest for the associated parties.
The main components of a strategy	The scope and range of a strategy, usage of resources, competitive advantage, synergy.	Synergy.

Source: compiled by the authors.

Companies often choose more than one strategy in order to achieve different goals. For example, the company can choose aggressive pricing strategy, willing to put on the market a new product and at the same time implement customer loyalty program to develop permanent consumers' base. Whereas the strategy, based on Game Theory application, is oriented into retention of competitive advantage and relations with other business environment subjects, including competitors. Similarly, to the strategy of traditional business environment, Game Theory strategy allows to identify and use the advantages of the company and implement the models of already made decisions (Wang et al., 2014). However, this strategy is not for the choice of business nature, identification of management levels, distribution of primary resources or investment into resources. Game strategy allows to define the interest of participating parties and match them optimally. In this way, the effect of synergy is created. According to Basar and Olsder (1999), the

application of Game Theory in business is set by the rules of decisions, which have to be maintained by the participants of a game in order to achieve the equilibrium of their interest.

To sum up: Game Theory is the theory of subject's (physical and legal entity) behavioral analysis, which researches how and what motives based on the subjects make decisions (business, strategy, forming relations, investment and other) in the conditions of conflicts of interest or co-operation. Paying attention to the huge number of set game rules and the description level of participating subjects' ultimate goals, Game Theory is considered to be a method, which should be applied in order to make an optimum decision in uncertain business situation (Amato et al., 2015).

Summary: *Game Theory presents mathematical methods, which allow to analyze situations, where one or more subjects make decisions, which make an impact on the welfare of each other. What is more, Game Theory allows to form systematic theoretical background for the analysis of strategic behavior, where one participating subject's choice depends on other participating subjects' choice, having in mind, that the results of decisions, made applying Game Theory, are often intuitive.*

1.2. Main concepts of Game Theory

Main concepts, used in Game Theory, are "game", "player", player's "benefits of scale" and "maximizing benefit".

In general understanding, a *game* means any social situation, which includes two or more subjects (Lahkar, 2012; Myerson, 2013). In this case, a game can be called such situation as the choice of business or life partner, friendship connections, establishment of relationship at work and other. According to Camerer (2003), treating a game as any other social situation, the situation itself and the behavior of its participants, who are sensitive to the details of environment, for example the choice of a potential partner, depends on the information, found about him/her, experience of communicating with him/her. In a narrower sense, paying attention to the type of situation, a game is a situation, where a conflict of interests between two or more independent agents, who make decisions or control people, are present (Gonzaga, 2006; Da Costa et al, 2009; Camerer, 2010; Amato et al., 2015 and other). For example, if one company wants to put on a market a new product and in this way to take part of a market, which is currently occupied by other company with ordinary products for the consumers, the interest of both companies cross in this situation. What is more, a game can be treated as the interaction of two or

more people in one system, when each participating party is willing to optimize a certain specific criterion, such as tools or the results of interaction (Camerer, 2003; Jadlovska, Hrubina, 2011; Myerson, 2013, Vainienė, 2015a and other). In this case, the analysis is performed on what behavior decisions are made by contracting parties, who act based on different rationality in the same situation, for example, how quickly and how much the seller in the market place decides to reduce the price for a potential buyer, who is interested in his goods and how long and how much the buyer negotiates. The decision of both parties can differ in different circumstances. *If the seller needs to increase the turnover of goods, he can offer a bigger discount for a buyer more quickly in comparison to a situation, when a seller's turnover of goods is big enough and he is more interested in earning profit and sell goods more expensive. The buyer can negotiate more actively for the price, if his budget is limited and vice versa.*

Players are the participants of a game. According to Wooldridge (2002) and Gonzaga (2006), a player is an independent agent. A player can be the manager of a company, director, company or any other concerned subject, for example, a person or a group of people, business, governmental or non-governmental organization (Bottura, 2009). According to Wooldridge (2002) and Gonzaga (2006), a player is the subject, who has the following traits:

- perceives himself and his own individuality;
- perceives his own external environment;
- perceives his own opportunities and their consequences;
- knows about other players and has certain interaction or a certain level of conflict of interests with them;
- is able to make wise decisions;
- is able to perform actions in order to achieve better current and future results;
- is able to pay attention to the consequences of present and future decisions and compare them with the consequences of present and future decisions of other players;
- is able to pay attention to the consequences of present and future, which can be created by the unforeseen decisions of other players and those decisions can possibly influence his own interest;
- is able to learn from the past experience and grounds his decisions on positive and negative experience.

Mayer (2013) has summarized the traits of players, which have been revealed by other authors and has made a conclusion, that two assumptions are applied in Game Theory: the players are rational and intelligent. The rationality of a player means, that he makes decisions in order to achieve his goals. According to Dixit

and Nalebuff (2008), it is often believed wrongly, that to apply Game Theory successfully, all players must be very rational even though the theory itself does not contain such requirement. The players can be vicious, jealous, or philanthropic and empathic. What is more, the motives of the players to take part in a game and the information they have might differ a lot. It is very important to see other players the way they are, not through the lens of yours or your behavioral model, while replying to the actions of other players and calculating the equilibrium.

The goal of each player is to maximize expected value, which is measured according to set *benefits of scale*. In 1738 Bernoulli raised the idea, that the person, who thinks and makes decisions rationally, seeks to maximize the expected value, however the newer interpretation of this idea has been produced by Neumann and Morgenstern (1947). Based on weak assumptions about how a person, who is rationally thinking and making decisions, should behave, authors show, that a certain way, to assign possible benefit to various possible results of decision, exists. He always chooses that possibility of a decision, which allows to maximize that possible benefit. The result of maximizing benefit is called *Expected benefit maximization theorem* (Mayer, 2013, p. 3). It is noted, that logical axioms, which ground the expected benefit maximization theorem, are little compatible assumptions between themselves. The main axioms here are "sure-thing" and "substitution" axioms, which interrelation could be rephrased in the following non-scientific language: *if a person, who makes a decision, prefers the choice 1 rather than the choice 2, in the event A and would prefer the choice 1 rather than the choice 2, when the event A did not happen, then he should choose the choice 1 even not knowing whether the event A will happen at all.* (Mayer, 2013). It is enough this assumption to confirm that a certain benefit scale exists to the person who makes decisions so that he always chooses that decision option, which provides him with the maximum return. According to Mayer (2013), constant wish to maximize the returns is connected with the principles of evolutionary selection. In the universe, where increasing disorder is the law of Physics, complex organisms (including human beings) can remain only when they behave in a such way, that maximizes their possibilities to survive in the conditions of natural selection. Hence, the individuals seek to maximize expected benefit of common survival (Smith, 1982).

It needs to be noted, that the maximization of benefit is not necessarily the same as the maximization of monetary profit, because the value of benefit in Game Theory is not necessarily measured by a monetary equivalent. For example, for risk avoiding individual, every monetary unit (1 euro) will be of a greater value, when he is poor, not when that individual is rich. Based on this remark, benefit maximization function for most of people, who make decisions, can be also nonlinear function of monetary value. On the contrary, an individual benefit, when making a certain decision, can depend on many variables, not only on the monetary value.

For example, an individual benefit can be called the gain of advantage in certain social layers (at work place, among business managers), wider spread of information about yourself and your activity or even monetary benefit, received from other people, who are close to the person making decisions and feel affection to that person.

***Summary**: even though a game means any social situation, which includes two or more subjects in general understanding, this interpretation of games is suitable more to social relations, but not to the analysis of business relations between the subjects. In terms of the analysis of business relations **(this has been shown within the situation analysis in practical part)**, the game should be treated as the interrelation of two or more subjects in one system, when each of the subjects has a goal to optimize a certain criteria such as tools or results of interaction, meaning that Game Theory is applied in the analysis of business situations in order to identify, what behavioral decisions are made by the interacting subjects, who in a certain situation act rationally different. Game Theory is applied based on the assumptions, that the players are rational and intelligent. However, as noted by Dixit and Nalebuff (2008), it is often thought wrongly, that seeking to apply Game Theory systematically, all players must be very rational, because this requirement is not present in the theory. The goal of each player is the maximization of expected return, which is measured by a set of benefits of scale, however the maximization of benefit is not necessarily the same as the maximization of monetary profit, because the value of benefit in Game Theory is not necessarily measured by a monetary equivalent.*

1.3. Value network structure in Game Theory

According to McCain (2014), business should be treated as a game and its participants should be called players, because the representatives of business and the business, as a subject, interact with other interested parties, such as consumers, suppliers, competitors and other. The interests of interacting subjects often cross, that is why business always seeks for the optimum decisions, which would allow to match the interests of all parties. However, even if the decision is made to become a player for the company, it is very important to decide, what role to undertake in a game. Kippenberger (1998) presents the value network model, which, in his opinion, helps business strategists to develop thinking about interrelations in a business game. Value model allows to identify the functions of the company and other players in a game and to perceive how much other players are willing to pay to the company, so that it would take part in a game or how much they are willing to donate in order to put off the company from the participation in it (see Figure 1).

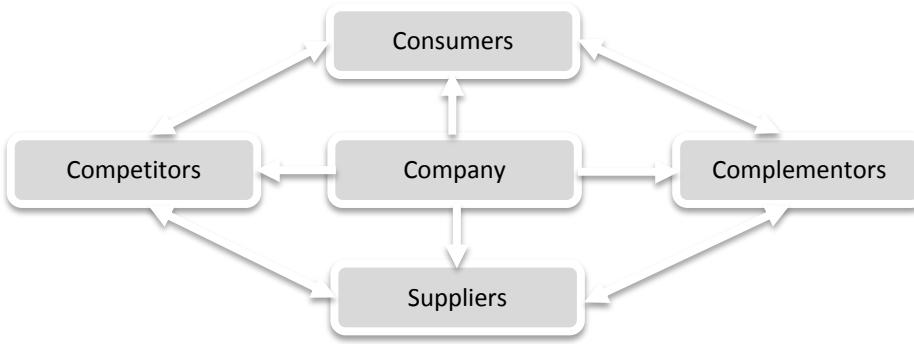

Figure 1. Value network in Game Theory

Source: Kippenberger, 1998, p. 23.

Even though vertical axis of value network (see Figure 1) is understandable quite easily based on the logics of Game Theory, it is very important to perceive the real dependency between the subjects. The suppliers and consumers usually create value at the beginning of the business and later these relationships turn to sharing the accumulated value (according to Kipplinger (1998) – booty). However, the supplier, who is dangerously dependent on one or two consumers, can decide to invest more into the expansion of consumers' base, than it would rationally be justified. This strategy could be chosen as a possibility to reduce the power of current consumers and the dependency from them trying to expand on more general consumer base. In a similar situation, the consumer, who is very dependent on one supplier, can foresee the goal to pay additionally to other supplier, only for the possibility to expand the supplier base. However, in some cases the stock, provided by the suppliers, can be of a very high quality and the supply of such stock can be very limited (for example companies "Compaq" and "Dell" compete for the possibility to acquire the newest "Intel" microchips).

From the value network model above (see Figure 1) can be seen, that in business networks between a company, consumers, suppliers, and competitors, one more subject, a complementor, appears. The examples of the subjects, who perform complementary functions in a value network scheme, could be such well known worldwide IT companies as "Microsoft" and "Intel". Company "Microsoft" creates complex IT programs and their packages, which create the demand for microchips of "Intel" company. Even though at first sight seems, that those companies are competitors in IT sector, however, they supplement each other, because they create the demand for the products of each other. One more example: competing airlines

create the demand for the construction of economic class airplanes. In the case of relations between a company and suppliers, the player is a complementor, if the supplier is willing to provide with the stock this player, and at the same time other player, and not to provide with the stock only the first player. However, if the supplier is willing to provide with the stock only the first player and not provide with the stock other player, then these players become competitors in stock market.

As noted by da Costa et al. (2009), Araujo (2010), Lahkar (2012), Myerson (2013), McCain (2014), McVea, Charalambu (2014), the principles of Game Theory can be applied for all possible forms of interaction in value network. Depending on which specific element is used to make an optimum business decision and get expected payoff from a game in Game Theory, the following elements are listed: players and their position in the market, creation and retention of value added by the players, rules of a game, tactics, and volume (see Figure 2).

A player is the main initiator and subject of a game. Thinking rationally, he seeks to make a decision, which could maximize expected benefit in a specific situation. Usually more than one participant is present in a game and all thinking rationally, they seek for the maximization of expected benefit.

In order to denote the functions of all the players in a game, the rules of a game are created and agreed how the game will go on and what actions can be or cannot be performed by the players. It is noted, that even the rules are set with the initiative and agreement of the players, they become an obligation and the players must keep to all of them in order to participate in a game. The ignorance of the game rules is treated as cheating.

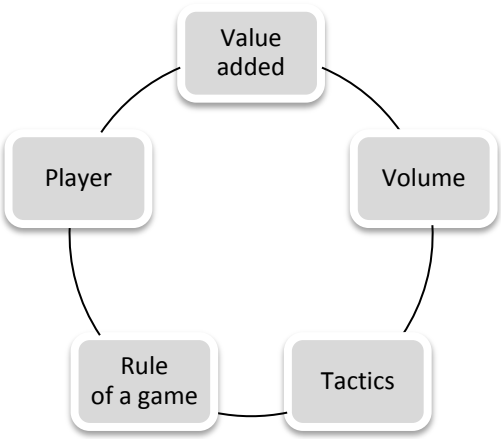

Figure 2. Elements of Game Theory and their interrelation

Source: compiled by the authors.

Knowing the rules of a game, a player can choose acceptable tactics such as seek to gain advantage against other players, behave risky or be cautious.

The volume of a game is chosen together with the tactics. A term "volume" is often used when describing the benefit, which can be foreseen behind the limits of current market place (Myerson, 2013; McVea, Charalambu, 2014), which means that the benefit can be potentially received through the entry of a thoughtful game. Suppose, a company can decide to submit huge orders for the producers or suppliers seeking to get discounts or to create the occupancy artificially so that they would not manage other orders of the competitors. If the company meets the working capital deficiency it could be more reasonable to submit more periodic smaller orders, rather than one big order.

Value added is described as the value, which could be created in a game by the player. For example, the company can increase the attractiveness of goods and services through the advertising campaign, the investment into modern technologies, research and development, value added can be created also through the introduction of advanced models of products or totally new products. Possible value added significantly depends on the tactics and game volume, and on the contrary, in order to achieve expected value added, the player chooses the tactics and volume of a game. General value added of a specific game is defined through the sum of all value added, created by all the players.

It is reasonable to review in depth the application of Game Theory principles to all named elements of Game Theory in practical business situations.

Players. Based on Game Theory, the main players of a game in value network must identify, what elements can increase or decrease the value added of their business (McCain, 2014). As seen from the value network model (see Figure 1), the distinction between the competitors and complementors is not always clear. In case of a doubt on the functions of each subject in value chain, the scientists (Camerer, 2003; Da Costa et al., 2009; Camerer, 2010; Alexander, 2014; Wang et al., 2014) recommend to evaluate the perspective from the consumers' position: if the consumers value more goods and services of one company (player), when they at the same time use goods and services of other company, then the function of such players is to complement each other. And on the contrary, when the consumers value less goods and services of one company (player), when they at the same time use goods and services of other company, then the function of such players is to compete with each other. For example, if the consumers have washing machines, they will buy washing products, therefore the producers of washing machines and washing products are complementors. Whereas, if a consumer uses clothes cleaning services and does not wash the clothes at home very often, he will

buy less washing products. As a result, the company of clothes cleaning services and the producers of washing products are competitors.

The rules of Game Theory. Traditionally the rules in all games are defined precisely. The rules in business are various law, requirements, principles within which the business is functioning. A contract is signed to determine the relationship and interaction between the business subjects (for example business relationship with providers). The rules of a game cover external requirements (laws, tax system requirements, confirmed methods of tax calculation, conditions for signing contracts) and internal requirements (purchase and sale conditions, presentation conditions, coalition action plan) in order to carry out a game. External rules of a game are essentially stable (laws and confirmed methods of tax calculation are changed rare enough in a country), however the internal rules of a game can be modified through the negotiation of all participating subjects (players) in a game. According to McCain (2014), negotiations can also modify the way, how the competitors perceive the value of a contract. For example, if a contract allows the supplier to serve not only one company, but also the competitors, such conditions allow chosen supplier to satisfy not only the needs of the initial client company, but its competitors as well. The initial client company has advantage, because such position enables the company to ask for discounts. Looking from the point of view of the supplier, such conditions at the very beginning of the activity might seem very attractive due to the possibility to expand the client network and service zone. However, in long term, having gained trust of the clients and formed client network, the initial conditions of the contract might not be such attractive anymore for the supplier, because he will be able to provide with the stock other companies, asking for a bigger market price, rather than applying discounts for the initial client company and loosing part of a potential profit. The supplier can offer to review conditions of the contract for initial client company. This shows, that even though the rules of a game are formally written down in a contract, they can be amended by the professional players for their own benefit. Similarly, one of the business partners, who has established business together with another partner, can decide to leave the company and start his own business, taking away loyal employees and clients. Such examples are common in various businesses. However, it is noted, that the initiative to change the rules of a game will come from that player, who more or less controls the game at that moment (only that partner, who is experienced enough and has a wide network of clients, will decide to leave other partner, and start his own business). What is more, once the rules have been changed, later they can be amended once again by another player. That is why, according to McCain (2014), the definition of the rules is a very important component of a strategy, however the strategy cannot be based on setting the rules only. According to Kippenberger (1998), "business is co-operation, when you need to

make a pie, however when the time has come to share that pie, it turns to a competition" (p. 25). Finally, if the interests of the players are totally different, it is recommended to change the rules of a game and start all over again (McCain, 2014; Kumar, Goyal, 2015).

Tactics. Game Theory can be applied, when forming business tactics. Business is often conducted in such conditions, which are called "fog" conditions (Nash et al. 2001; Gladwell, 2011; Rosenthal, 2011; Kumar, Goyal, 2015; Chadha, 2016). This means, that acting in a specific market conditions, the business subject is never sure about, what is happening for real and, what are all possible decisions, how the situation is perceived by the opponent and what is the opinion of the opponent, about the situation of the competitors. Game Theory can help the player to perceive and change the perception about other players in fog conditions. If one of the players is very strong and influential and other players are not, they should not ignore this fact, but use it. For example, company "Gillette" has put on a market a new shaving product line "Sensor" for sensitive skin and was certain, that this product line is far superior, than other product lines on a market. The company justified this belief through the advertising campaign of new product line, worth of 100 million USD. The consumers felt, that it is worth trying this product after facing such obvious self-confident campaign. The sales of "Gillette" have increased by 70 % worldwide. The companies, which seek to demonstrate, that their products or services are far better than other similar products on the market, should think of such tactics as the distribution of free testers, warranty or providing free services for the new clients. This is the way how to dispel the fog, according to Kippenberger (1998).

If a player is not willing to undertake obvious advantage tactics in order to demonstrate his power, it is advised to take obscure tactics (Gladwell, 2011; McVea, Charalambu, 2014; McAdams, 2014). The example of obscure tactics' application is business has been described by Kippenberger (1998). According to the author, in 1992 airline "American Airlines" has announced the change of pricing in order to simplify previous confusing pricing system and reduce fee number only up to four categories. The main goals of the pricing change were to increase the competitive advantage through the reduction of confusion between the consumers, due to complex previous pricing system, and reduce administration costs. The first changes have been positive due to new simplified pricing structure. The consumers have easier understood the pricing principles of the company. And it was much easier to apply the price discounts. However, the competitive advantage was only temporary. Some other airline companies have perceived this strategy as a treat to their position in the market. Shortly after the announcement about the pricing change in "American Airlines", other companies have followed this example. Company "TWA" has announced the decrease in prices by 20 %, trying to take

over the customers from the competitors, who did not change or hide their prices anymore. The initiative from "American Airlines" has collapsed over six months. This has happened because the companies, like "American Airlines", which have risky financial balance, need to obscure their pricing with the principles of complex counting. Then the companies get benefit in short term, because their pricing strategy is not clear for the competitors and they cannot manipulate with their prices in order to take over the customers. Due to the under evaluation of this fact, the company "American Airlines" has experienced the loss of 5 milliard USD that year.

Volume. Volume is an element of Game Theory, which means the extent of a game. For example, in business practice, it can be associated with the volume of production, sale, orders, or advertising. Suppose, the company, which produces hair shampoo, possesses old product line, which has not been sold out previously. In the market of developed countries, enhanced products of modern design become more attractive for the consumers and substitute old product lines become of no interest for the consumers, that is why the competitors must follow the example and renew the content of shampoo and modernize the product design. However, the company can enter the markets of developing countries, where old goods, which remained in the warehouses, can be sold, because even an old product line appears attractive there. The company will try to sell as much as possible, as quickly as possible, till the goods in the market are still popular. So, the volume of a game in the market of developing countries, will be huge.

An example of a huge volume game in a real business world has been described by Kippenberger (1998) in his study "*Applying Game Theory to strategic moves"*. The author describes how the producer of toiletry and household chemical products "Minnetonka" manipulated the volume of a newly created product in order to limit competitors' entry to the market at the initial period of putting the product on a market. According to the author, when the results of trial pricing showed, that the newly created disinfect liquid soap called "Softsoap" could be in demand and cover 5–9 % of total bar soap market, the company has started a huge campaign worth of 7 million USD in order to put the product on a market. Since the new product has not been patented, the managers of the company were mostly worried that they have started a game against big and powerful competitors in toilet soap market. Due to the selling potential, big competitors could have easily duplicated the product, which has not been patented and put it on the market together with their well-known brands. To avoid this threat, the managers of "Minnetonka" have used the *element "volume" from Game Theory*. First of all, they have found out that only two producers are on the market of dispenser mechanism, which is necessary for the usage of liquid soap. Huge order volumes for the dispenser mechanisms have been submitted to increase the occupancy and capacity of the produc-

ers. With the help of this strategy the company "Minnetonka" has become the market leader of disinfect liquid soap for five years.

Having analyzed the strategy of company "Minnetonka", Kippenberger (1998) stresses, that the advantages of volume element tried to use not only the company, but its competitors as well, who have participated actively in the market: willing to retain their position in the market, competing bar soap producing companies have increased their value added of produced bar soap, rather than started risky production of liquid soap, as they have though. It is noted, that the demand for disinfect liquid soap was not huge at the beginning of market entry, it was mostly acquired by the public institutions, such as hospitals or clinics. Due to this reason, competing bar soap producing companies thought, that the development of liquid soap cannot be successful. On the contrary, the production of disinfect liquid soap has been treated as a totally separate business, not connected with the production of bar soap. Only after some time, having noticed the perspective, the biggest soap production companies have entered the liquid soap production and sales market, however this entry has been too much delayed: disinfect liquid soap "Softsoap" of company "Minnetonka" has been the market leader for the five years after the market entry and finally this brand has been sold to company "Colgate-Palmolive" for 61 million USD. This example illustrates, how strategically using the advantages of volume element, the company can protect its products from being duplicated and delay the market entry of the competitors.

Value added. The difference between common value added, created by all the players, and the value added, which can be created even when one of the players is not participating, shows the value added of this particular player, in the context of the whole game. Even though this mathematics may seem to be poor for an individual player (especially, when his created value added is quite small) the calculations of value added can be very informative. In the markets, where competition is intense and many suppliers of undifferentiated products are present (in the markets of perfect competition), created value added of any player is small. And on the contrary, if only a couple of product sellers or services providers are present in the market (in oligopoly markets), created value added each of the players is big enough.

However, some scientists (Nalebuff, Branderburger, 1997; McAdams, 2014; McCain, 2014) contradict common assumption and state, that value added depends not only on the player's part in the market, but also on the choice of business strategy, meaning, that the business strategy can condition value added. Nalebuff and Branderburger (1997) illustrate their idea comparing the strategies and profit of a company "Nintendo", which acts in children video game market, and a company IBM, which acts in a laptop market. They have identified, that each

aspect of selling 8-bit video game strategy of the company "Nintendo" was devoted to gain control as much as possible in the creation and retention of value added. If this strict control would not have been put in place, huge volumes of piracy version of a game, software plagiarism and distribution would have caused a serious risk for the strategy of the company. "Nintendo" company has thoroughly controlled each aspect of the creation and retention of value added, assuring that the created value added is maximized. For example, "Nintendo" consciously gave up sales positions in the market to the biggest retail companies and at the same time they have thoroughly controlled the supply in order to create bigger demand and retain its power in the market. On the other side of the chain (in manufacture side), "Nintendo" has limited the number of newly produced video games, put on a market, until five new games a year. In this way, the biggest attention was paid to the quality and not to the quantity. Based on the statistical data, provided by Kippenberger (1998), the strategy of "Nintendo" was such successful, that within five years from the establishment in the USA market, the company's average market capitalization exceeded such companies as "Nissan" and "Sony".

According to Kippenberger (1998), differently from "Nintendo", other technology company IBM, has chosen not the creation of value added strategy, but the increase of sales in growing computer market strategy. Keeping to this strategy, IBM has joined forces with "Intel" and "Microsoft" companies, so that they would help to create IBM branded personal computer. Speed was the absolute benefit of this strategy. The decision to use open computer creation structure has been made deliberately in advance, which has allowed to speed up the process of software creation for a new computer. The negative aspect of IBM strategy, which the company has faced as quickly as it has launched its brand-new computer, was, that when other companies have copied the model of IDB computer, "Intel" and "Microsoft" have gained the biggest benefit out of this situation.

As seen from these two examples, the strategy of "Nintendo" from the beginning has allowed to assure that all value added, created by the company, will be accumulated, even though this has been reached limiting the volume of sales. Whereas, the strategy of IBM, has produced the opposite results: the company has tried to speed up the creation of a new product, however the value of the product has been created not by itself, but by other companies according to a contract. Inability to retain the creation of value in own hands has finally raised a threat to the main business of IBM. Based on Game Theory, IBM company could have paid "Intel" and "Microsoft", so that they would participate in a game, meaning, the creation of a cartel agreement to limit reciprocal competition. This would have allowed IBM company to remain the dominant player in computer market.

Summary: *Analysis of Game Theory principles application for various structural elements of this theory has shown, that looking at the perspectives not so contradictory, business companies can successfully direct their current strategies for the increase of effectiveness. Every business subject possesses exclusive features or relations with external environment. Game Theory allows to identify and use these features purposefully. Even though winning sometimes can be achieved with the expense of competitors, constructive approach means to look for the ways, how to develop business opportunities not only for one specific company, but for bigger number of the players. Of course, the application of Game Theory principles in a strategic context requires huge attention to the tactics, including the choice of a game type, negotiations, maneuvering. Besides the choice of one or more elements of Game Theory to gain the expected benefit, it must be remembered, that the game is not isolated. The players, who are active in few games, create links between the games. So, the participation in one game in the role of a leader can mean the participation in couple of games in the role of a secondary subject. Failing to see the links between the games, the player can gain benefit in a short term, however he can experience losses in a long term.*

1.4. Connection of Game Theory with the theories, which analyze the decision making in uncertainty conditions

Game Theory in scientific literature is often related with *Expected Utility theory*, according to which, the people, who make business decisions, choose between risky and non-risky perspectives, comparing the expected outcomes of such perspectives, meaning, that they assess the value of expected benefit, which could be received in both cases, the risky or non-risky one (Mongin, 1997; Wigfield, Cambria, 2010; Holland, 2011; Freeman, 2011; Doukas, Zhang, 2013; Chen et al., 2016).

Expected utility hypothesis has been introduced by Daniel Bernoulli for the first time in 1738. Until XX century the average standard expected utility condition was *moral expectation*, which created a contrast for the condition of *mathematical expectation* (Berger et al., 2014; McAdams, 2014, McCain, 2014). Necessary and sufficient conditions in which expected utility hypothesis operates are proved in 1944 by von Neumann-Morgenstern in *von Neumann-Morgenstern utility theorem*. This is:

- Condition of completeness, the priorities of a player are defined accurately and he can always choose from two alternatives, meaning that the player takes a priority for the alternative A but not B, is indifferent to both alternatives or takes a priority for the alternative B (mathematically $A \geq B$ or $A \leq B$);
- Condition of transitivity, when the player makes a decision according to completeness axiom, he does that consistently (mathematically, when $A \geq B$ and $B \geq C$, $A \geq C$);
- Condition of independence, when two games are related to the third one, the same sequence of priorities is maintained also when two games take place independently to the third one (mathematically, if $A \geq B$, and $t \in (0,1]$, then $tA + (1 - t)C \geq tB + (1 - t)C$);
- Condition of continuation, when three alternatives are possible and the player takes a priority for the alternative A against alternative B, and alternative B against alternative C, possible combination should be between alternatives A and C, and the player does not see any difference between the combination of A-C and alternative B (mathematically when $A \geq B \geq C$, probability p exists, when alternative B is good as the combination of $pA + (1 - p)C$) (von Neumann, Morgenstern, 1953; Johannessen, Olaisen, 2008; Najmi et al., 2009; Sonmez, 2013; McAdams, 2014).

Expected utility hypothesis in Game Theory means that, when the players take a priority for a specific choice and the result of that choice is not assured (Holland, 2011; Doukas, Zhang, 2013). Based on this hypothesis, the value of a subjective decision, gained from a game, is statistical probability of the individual's assessment, which is connected with the result of a game. (Freeman, 2011). The explanations of popular decisions are based on expected utility hypothesis in Game Theory, which seem to contradict the criteria of expected utility, based on which the payoff of the decision and the probability of the event are assessed. For example, decisions in gambling or insurance contracts are made based on expected utility hypothesis (Freeman, 2011; McCain, 2014; Carter et al., 2015).

Even though expected utility theory is treated as normative descriptive model for a couple of decades, while analyzing business decision making in uncertain conditions, this theory has been criticized as not providing a detailed explanation about the individual choice on the decision (Tversky and Kahneman, 1992; Johannessen, Olaisen, 2008; Doukas, Zhang, 2013). Many experimental proves have been gathered, some from utility theorem listed conditions (completeness, transitivity, independence, and continuation) by von Neumann and Morgenstern (1944), can be damaged by the players, who make real decisions in practice within risky conditions, such decisions often differ from those, which would have been made based on expected utility theory assumptions (Johannessen, Olaisen, 2008; Doukas, Zhang, 2013). New theories have been created as an alternative for the expected utility theory (called unexpected utility theories), which explain how business decisions are made in risky conditions. The most meaningful theories, based on which business decision making processes and results are analyzed, are presented in Table 2.

Table 2. Analysis of theories for business decisions, made in risky conditions

Theory	Main principles	Researched authors, year	Area of researches
Prospect theory	Players are not willing to experience losses and choose the alternative, which could maximize their perceived benefit.	Hunt, 2010; Alam, Tang, 2012; Agarwal, Zeephongsekul, 2013; Hutzschenreuter et al., 2014; Wasiuzzaman et al., 2015; Yan, Liu, 2016 and other.	Relationship between the principles of prospect theory and change of oil prices in Iran; behavior of Islamic Banks in financial markets; psychological aspects of pricing in the cases of merger and acquisition; behavior of local companies when foreign competitors enter local market; relationship between characteristics of industry and management of earnings; problems of multistage group decision making.

Theory	Main principles	Researched authors, year	Area of researches
Cumulative prospect theory	Players feel like they move away from a certain starting point and they are willing to assess the accumulated benefit or accumulated losses while making decisions but not the single benefit or loss from a decision.	Schmidt, Zank, 2008; Barberis, Huang, 2008; Schneider and Spalt, 2010; Nilsson et al., 2011; Doukas, Zhang, 2013; Liu et al., 2014 and other.	Relationship between the principles of cumulative prospect theory and risk avoidance in business; assessment of securities and their returns; impact of cumulative prospect for the decisions of company acquisitions; relationship between advantages of alternatives and risk avoidance; impact of cumulative prospect for acquisition of banks; analysis of risky decisions in critical situations;
Fourfold Pattern of Risk Attitudes Theory	Players behave according to one of four behavior models: avoid risk, when the possibility of loss is low, avoid risk, when possibility of gain is high, are willing to take risk, when the possibility of loss is high, are willing to take risk, when the possibility of gain is low.	Harbaugh et al., 2009; Forbes, 2009; Machina, Viscusi, 2013; Pahlke et al., 2015 and other.	Assessment of consumer choice and price setting; assessment of investment property; assessment of decisions, which are made in risky and uncertainty conditions; impact of responsibility for decision making in risky conditions and other.
Behavioral portfolio theory	Main goal of the player is not the maximization of benefit; the goals can be various and resemble a multi-layer goal pyramid.	MacCowan, Orr, 2008; Luzzini et al., 2012; Rengifo et al, 2014 and other.	Analysis of property fund managers' decision making; application of behavioral portfolio theory principals, while assessing the costs of purchase portfolio; application of behavioral portfolio theory principals in investment management and other.

Source: compiled by the authors.

As seen from Table 2, from unexpected utility theories the following ones can be distinguished: *Prospect theory,* which was introduced by Kahneman and Tversky in 1979, however, many scientists apply this theory in current researches about human behavior, *Cumulative prospect* theory, *Fourfold Pattern of Risk Attitudes* theory and *Behavioral portfolio theory*.

Based on prospect theory, when a person, who participates in a game, has to choose from two or three possible results, he behaves in such way, that would allow him to maximize "S" form value function (see Figure 3).

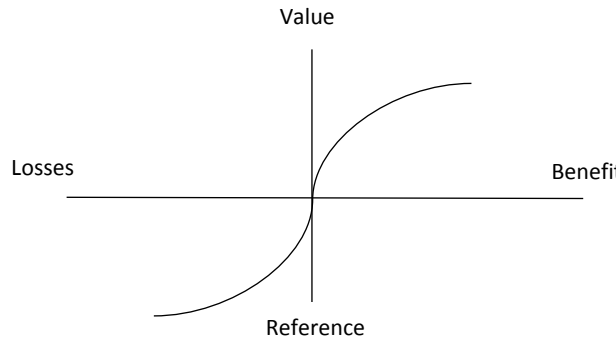

Figure 3. Payers' value hypothetical "S" form function, according to prospect theory

Source: compiled by the authors with the reference to Kahneman and Tversky (1979), p. 279; Abdellaoui, Hey 2008; p. 115; Malakooti, 2013, p. 69.

According to the authors of prospect theory, Kahneman and Tversky (1979), value function is denoted as the deviation from *reference point*, at which the value of the player is equal to zero (meaning that the player has not incurred neither losses nor gained any benefit). As seen from the data, collected by independent researches in various business areas, the benefit function of the most players is concaved, the loss function is convex (Abdellaoui, Hey 2008; Hunt, 2010; Baker, Nofsinger, 2010; Alam, Tang, 2012; Malakooti, 2013; Levy, 2013 and other). What is more, "S" form value function is of a steeper form, when the expectation is to get losses, not the benefit (Alam, Tang, 2012; Malakooti, 2013). This shows, that most often the players are not willing to incur losses. It is important to have in mind, that this value function, which can be applied in order to reflect the priorities of the player, while choosing from possible prospects, can be more complex, then it

is shown in hypothetical graph (see Figure 3). This is because the attention is paid only to the value, benefit and losses perceived by the player, but the weight of the player's decision is not assessed (Alam, Tang, 2012; Agarwal, Zeephongsekul, 2013; Hutzschenreuter et al., 2014; Wasiuzzaman et al., 2015 and other). According to Alam and Tang (2012), the value of decision, made by the player, can impact higher or lower risk acceptance or avoidance level even when the player's value function remains unchanged. So, every value of possible result should be multiplied by the weight of decision. (Malakooti, 2013). The weight of decision is the choice between the subjective probabilities, however it is not a prospect, therefore, the weight of decision should not be assessed based on the credibility level assessment unit. Let us imagine a situation, when a player can win 1000 euros or can win nothing depending on which side of a coin will remain open. Based on probability theory, the possibility of winning or losing in this case is 50/50. However, the player, due to subjective reasons, can be sure, that the coin will be open on a certain side. In this case, his decision weight will be higher than a simple mathematical probability of 50 % and vice versa. In other words, the weight of a decision shows the impact of an event for the expected consequences of preferred decision. The function of hypothetical decision weight is shown in Figure 4.

Hypothetical player's decision weight function, which applies to the assessment of player's decision weight, when a certain event is unlikely to happen, is shown in Figure 4, when a player is not sure, whether his expected event will happen or not, and can modify his decisions, when the possibility of an event to happen is changing. The slope of the curve in the section shows the player's sensitivity to the changes of probabilities. Rising the curve upwards, the player's sensitivity to the change of probabilities is declining and the curve is becoming steeper. When certain doubts are present, limits of the decision weight can appear. Otherwise, simplification of prospects can encourage the player to decline low probability events and treat the events of high probability as they will definitely happen. According to al-Nowaihi and Dhami (2010), as human abilities to perceive and assess the prospects are limited, the events of low probability are totally ignored or their meaning is overvalued. Similarly, it is not assessed enough or overvalued the difference between a high probability event and the event, which will certainly happen. Besides, the decision weight demonstrates subjective player's point of view towards the situation, the function of decision weight can be non-linear. Booij et al. (2009) gives an example, when a player is involved into a Russian roulette and gets a possibility to pay a certain amount, so that one bullet would be removed from the weapon. Then regardless of the mathematical probabilities, the player is interested to pay so much, that all bullets will be removed from the weapon. So, in this situation, the subjective value of money for the player will be much lower than the possibility to avoid bullet.

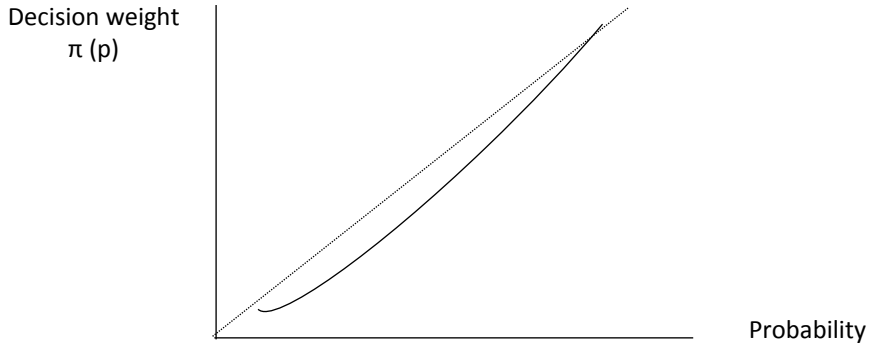

Figure 4. Hypothetical player's decision weight function, according to prospect theory

Source: compiled by the authors with the reference to Kahneman and Tversky, 1979, p. 283; Kahneman and Tversky, 2000, p. 68; al-Nowaihi and Dhami, 2010, p. 7.

Based on information about cumulative benefit and cumulative losses, Tversky and Kahneman (1992) have improved their initial prospect theory and formed its new version – Cumulative Prospect theory. According to this theory, a person feels like moving away from a specific starting point, so making the decisions he is willing to assess cumulative benefit and cumulative losses and not only single benefits or losses of a decision. According to Forbes (2009), cumulative prospect theory allows to assess a person's decisions and actions in the event of a specific benefit or loss, even when separate probabilities are difficult to calculate.

Two main factors of cumulative prospect theory are *reference dependence* and *dependence on probability weighting* (Birnbaum et al., 2008; Schmidt, 2009; al-Nowaihi, Dhami, 2010; Baele et al., 2014 and other). Dependency on information means, people, who make decisions, have a tendency to model possible results of a decision as benefit or loss, received in initial position at a reference point. In statistical and mathematical models reference point or the level of current welfare is zero (Schneider, Spalt, 2010; al-Nowaihi, Dhami, 2010; Baele et al., 2014 and other).

The scientist Barberis and Huang (2008) in their research about the assessment of securities through the eyes of investors, referred to the principles of cumulative prospect theory. According to the authors, bigger players' willingness to a game can be a directly connected with how the players assess the probability and cumulative benefit. Based on cumulative prospect theory, the investors take a priority to asymmetry. The results of authors' researches have showed, that asymmetry of

securities can be priced: positively asymmetric securities can be priced too high by the investors even though they generate negative average excess return, contrary, to that, what is expected in the case of utility theory. As noted by Baker et al. (2009), the prices of securities offers are often subjective. The authors have analyzed the highest dynamics of securities in 52 weeks and have identified, that the possibility to accept the offer unevenly increases, when the price of securities exceeds the targeted highest price during 52 weeks. And on the contrary, the reaction of receivers to the offer gradually becomes negative, when the price of offer decreases bellow targeted highest price during 52 weeks. It is so, because the investors are not totally adapted to current losses and are willing previous incurred losses to transfer to future prospects, and choose more risky decisions, for example, a game in the area of possible losses. The assessment of probabilities in this case means, that the investors expect benefit, even though it is not likely to happen. When such a situation is present in the market, the attractiveness of insurance tools and lotteries can increase. Statman (2002) states, that participation in a lottery and securities trading are negative sum games, which means, that the games, where high risk and negative expected benefit are combined. According to Doukas and Zhang (2013), people participate in lotteries or trade stocks due to the following reasons:

- All people, who participate in a lottery and trade stocks, are too self-confident, they think, that they exceed average and have more chance of winning even in negative sum games;
- Lottery players and stock traders seek to achieve more in life, for example from labour class to enter to middle or upper class.

Polkovnichenko (2005) provides experimental proofs, which confirm, that lottery players take priority to the dependency to upper class social layer. Having analyzed the data from households, the author has distinguished two the most common behavior types, which are not compatible with expected utility theory model:

- Most of the households invest to well diversified security funds and at the same type to poorly diversified stock funds;
- Some of the households, who have big enough savings, do not invest into stock at all.

Households or single people, who become players in investment markets, are willing to assess not the benefit, which is expected from one investment, but cumulative benefit in long term. The results, which have been produced by Polkovnichenko (2005), He and Zhou (2011) also Doukas and Zhang (2013) show, that households do not show preference to simultaneous gain, which could be received from the investment, for example, into rapidly growing stocks of a company, but

are more interested into long-term security of their funds, therefore they choose portfolio diversification rather than quick profit strategy. Due to the same reason, some households, ho have big enough savings, totally refuse to invest into stocks in order to avoid any risks, connected with such investment.

Cumulative prospect theory is not only applied into the analyses of investors' behavior, but also in the researches of risk avoidance in business (Schmidt, Zank, 2008; Nilsson et al., 2011), risky decision making in critical conditions (Liu et al., 2014), decisions to acquire companies (Schneider and Spalt, 2010; Doukas, Zhang, 2013) and other.

Cumulative prospect theory has been further improved and developed into *Fourfold Pattern of Risk Attitudes Theory* (Tversky, Kahneman, 1992). Based on this theory, the behavior of a player is analyzed in the following four aspects:

- a player avoids the risk, when a probability of loss is low;
- a player avoids the risk, when a probability of benefit is high;
- a player is willing to risk, when a probability of loss is high;
- a player is willing to risk, when a probability of benefit is low (Harbaugh et al., 2009; Doukas, Zhang, 2013).

Even though, the theory of Fourfold Pattern of Risk Attitudes allows to predict the player's attitude towards the risk quite accurately, however, according to Harbaugh et al. (2009), it is effective only, when the player must declare about his wish to pay for risky prospect according to the rules of a game. If there is a need to pay for risk, then, as authors have identified, the results of theory principles application do not differ from the results of a random choice. What is more, the authors (Harbaugh et al., 2009) have also found out, that the player's fourfold attitude towards the risk is sensitive to setting the priorities: fourfold pattern of risk attitudes traits were detected in the behavior of 25 graduates from Berkeley and Stanford, meaning that, when facing a risky prospect, these people were willing to risk more, that to wait for less likely benefit.

As an alternative to the assumption, that the main goal of the player is maximization of value, Shefrin and Statman (2000) developed *Behavioral Portfolio Theory*. Based on this theory, the goals of the players can be various, therefore, their behavioral portfolio resembles a multi-layer pyramid, where each of the layers meet a specific goal of the player. According to Bank (2011), basic goal of each player is to avoid financial catastrophe. Authors Muradoglu and Harvey (2012) also Alghalith et al. (2012) name this goal as a basic safety purpose. In the upper layers of pyramid the goals of profit (return), also the goals to be able to transfer to the upper society or business layers or emotional benefit goals are present. According

to Brouwer (2009), the precise range of behavior portfolio pyramid resembles Maslow personal hierarchy of needs.

Summary: *even though in scientific literature Game Theory is often related with expected utility theory, with an assumption, that the players before making one or other decision, compare risky and non-risky prospect values, expected utility theory often cannot explain some players' decisions, which seem to contradict with the criteria of expected utility. What is more, according to Doukas and Zhang (2013), expected benefit in uncertain conditions can be denoted and calculated only, when probabilities are assigned to every uncertain event, however this condition is not always satisfied in practice. Due to named reasons, while analyzing the motives of players' decisions, it is reasonable to rely not only on expected utility, but also on other alternative theories – prospect, cumulative prospect, fourfold pattern of risk attitudes and behavior portfolio, which allow to assess the player's sensitivity to losses, understanding of cumulative benefit or losses, the level of willingness to risk or risk avoiding and the goals of a game.*

1.5. Review of scientific researches on Game Theory application in business

According to McCain (2014), application of Game Theory in the analysis of business decisions, treating the interaction between business subjects like a game, allows to combine the elements of mathematical, economic, and human behavior and get clear and reasonable approach towards the behavior of business players, perceive the motives of reasonable business strategies choice and assess possible results of chosen strategy.

The background of Game Theory in such situations, as conflict of interests, which are common in economic and business practices and it is important for the subjects, acting in these areas, to find the optimum way to solve the problems. Recently the increase is noted in scientific researches, which are focused on how the principles of Game Theory are or could be applied, while making various business management decisions. The main scientific researches and their directions, which analyzed the impact of Game Theory to business management and investment decisions, are overviewed in Table 3. What is more, the research, performed by the authors, is provided in the empirical part of this monograph.

Table 3. Directions of scientific researches for the application of Game Theory in business

Directions of researches	Object of research	Authors, years
Competitiveness and co-operation	Possibilities of competitive co-operation between business subjects	Gnyawali et al., 2006; da Costa et al., 2009; Bengtsson et al., 2010; Brandenburger, Nalebuff, 2011; Gnyawali, Park, 2011; Jadlovska, Hrubina, 2011; Myerson, 2013; Bengtsson, Kock, 2015; Alves, Meneses, 2015 and others.
	Strengthening of leadership	Timothy, 2013
	Structure of negotiation game	Dixit, Nalebuff, 2008; McCain, 2014; Bono, Wolpert, 2014
	Acquisition of companies	Schneider, Spalt, 2010; Shaoluo et al., 2011; Agarwal, Zeephongsekul, 2013; Doukas, Zhang, 2013
	Modelling activity of alliances	Arend, Seale, 2005
	Co-operation and partnership in creating infrastructure	Eriksson, 2007
Management of supply chain	Strategic integration of game principles into the management of supply chain	Arora, 2012
	Optimization of logistics	Reyes, 2006
Making economic and financial decisions	Investment management	Barberis, Huang, 2008; Baker et al., 2009; He, Zhou, 2011
	Strategies of foreign direct investments	O'Connor et al., 2014
Business control	Setting optimum business control method	Jadlovska, Hrubina, 2011;
	Setting order amount	Olgun et al., 2016
Business risk management	Investment risk management	McVea, Charalambu, 2014
	Market price risk management	Sahin et al., 2009;
	Risk avoidance	Schmidt, Zank, 2008; Nilsson et al., 2011
	Risky decision making in critical conditions	Liu at el., 2014
	Fixing property value	Samsura, van der Krabben, 2012

Directions of researches	Object of research	Authors, years
	Interrelation between company's environmentally friendly advertising statement and its practice	Amato et al., 2015
Assessment of business intellectual capital	Planning strategic scenario for company's intellectual capital	Chen, 2003
	Knowledge sharing	Chua, 2003; Ho et al., 2009; Carayannis et al., 2014

Source: compiled by the authors.

As seen from Table 3, the principles of Game Theory in scientific literature are applied widely for the analysis of competitive and co-operative opportunities in business and business risk management aspects. In the first case, the analysis is focused on competitive co-operation between the business subjects and the opportunities of leadership establishment, the structure of negotiations game, the cases of company acquisitions, motives for the creation of alliances and modelling their activity, the principles for the infrastructure of co-operation and partnership. In the second case, the analysis reveals how Game Theory can create benefit for the management of investment and the risk of pricing, reveal the reasons, why business owners can avoid risk, how business decisions are made in critical situations, how the value of property is being fixed and what is the relationship between the theoretical statements of business advertisement and their practical application.

Narrower application of Game Theory in business within scientific researches can be attributed to supply chain management researches, economic and financial decision-making researches, business control and company's intellectual capital assessments researches. Business enterprises in the supply chain studies are mainly based on the principles of strategic gaming integration into the supply chain management analysis and logistics optimization analysis. The economic and financial decision-making researches are based on investment management and foreign direct investment planning analysis. Many scientific studies analyze the impact of Game Theory to the investment decisions (Shefrin and Statman, 2000; Statman, 2002; Polkovnichenko, 2005; Barberis and Huang, 2008; Boyer et al., 2010), some studies analyze the meaning of taking priority to asymmetry (Barberis and Huang, 2008), when, based on cumulative prospect theory, certain anomalies in financial markets are attempted to be explained. The business control studies examined the determination of an optimum business control method (Jadlovska, Hrubina, 2011), the aspects of setting orders' amount (Olgun et al., 2016). The assessment of intellectual capital in a company is based on planning

the scenario for intellectual capital (Chen, 2003), knowledge sharing internally (Chua, 2003) and also the analysis between individual companies (Ho et al., 2009; Carayannis et al., 2014).

Summary: *In terms of Game Theory application is business, it is noted, the scientists not only analyze situations of typical conflict of interest between the interacting subjects in specific business conditions, but also seek for the ways, how competing companies could start co-operation and what strategies would allow to improve the relationship between the buyer and the seller. The results of scientific researches on the named topic are overviewed deeper in the following subchapters and in the empirical part of this book.*

1.5.1. Obstacles and opportunities for co-operation in case of Prisoner's dilemma

As stated by Reardon and Hasty (1996), three main problems exist, which prevent from achieving co-operation in case of Prisoner's dilemma:

- Payoff function gives the benefit in short-term to the player, who breaches the agreement.
- The game takes place only once.
- The transaction costs, when acquiring goods abroad, are generally higher, than inside the purchasing country.

The payoff function, in the case of Prisoner's dilemma, is greatly impacted by the external environment and the structure of both companies, which sign the agreement. The payoff function, according to Perc and Szolnoki (2008), Szolnoki et al. (2008), Fujiwara-Greve and Okuno-Fijuwara (2009) also Marren (2011), is available to the companies after having assessed three main factors:

- Direct risk;
- Negotiation skills;
- Management priorities.

These factors often impact such payoff function, which is compatible with the communication in the form of Prisoner's dilemma. Direct risk, which the players face while making the agreement, can cover the changes in financial conditions of business, volume of acquisitions and relative size of buyer's company (Szolnoki et al., 2008). If the buyer's financial situation is good, the risk of losing one business deal is not regarded as high. And on the contrary, if the buyer feels financial stress, the loss of a single deal will look great and can pose a risk to the company's future viability. Due to this reason, the more stable and bigger companies participate in a game, the lower direct risk they encounter. And yet, smaller, and financially less secure companies can be very dependent on each deal, including both: transaction size and quality.

The payoff function, in case of Prisoner's dilemma, also depends on a relative volume of a purchase (Marren, 2011). In general, the bigger the volume of a purchase is, the more benefit can be received from cheating or ignoring the rules of a game, meaning, that cheating and ignoring the game rules can bring more benefit in bigger deals, not in smaller ones (Svensson, 2010). Similarly, in the case of a Prisoner's dilemma, the time of a purchase can be very important (Marren, 2011). For example, if a seller orders clothing shipment for winter holidays from a single

foreign supplier, with delivery conditions 9/25, the risk of benefit or losses for this seller can be very high. Finally, the relative size of the company is partly determined by the volume of potential losses if a counterparty fails to fulfill agreed conditions (Eriksson, 2007; Marren, 2011). Small companies should be concerned more regarding the deals with foreign partners, because the losses from such deals could be high. So, the company, which is more stable, can use the company, which is less stable and dependent from the deal. Probably due to this reason, many smaller retailers choose imported goods from the local importers, rather than placing orders directly to exporters abroad.

Retailer's negotiation skills can prevent from the possibilities to take advantage on him by a foreign seller. The skills of international negotiations depend very much on the retailer's experience in international trade. According to Marren (2011), the experience in international trade allows to forecast market negotiations more accurately. The knowledge on international financial instruments, trading conditions, trade rules can help the buyer negotiate for favorable deal conditions. The asymmetry of experience in international negotiations can create perfect conditions to get benefit for the experienced player. (Perrons, Platts, 2004). It means, that the experienced player has the possibilities and motives to take advantage against the less experienced player.

The impact of management priorities to payoff function in case of Prisoner's dilemma is demonstrated through the risk tolerance, stick to priorities and perception of management (Marren, 2011). If a company manager, who takes part in negotiations, is not risk tolerant, other player can get more benefit, while concentrating on the risk factors in the process of negotiation or can change these actions in the process of the agreement. Time priorities can also impact the sensitivity of a deal. The players, who must stick to the set deadlines, cannot maximally use their negotiation power. What is more, if one party of a deal perceives the deal as very important, this fact can allow the other party to keep the first one as hostage of the deal.

It is noted, that payoff function, in case of Prisoner's dilemma, is a specific number of recurrences in the process of agreement (Szolnoki et al., 2008). Payoff is denoted here as present value of future payoff (Szolnoki et al., 2008; Marren, 2011; McCain, 2014). The case of single recurrence (when making simultaneous deals), both parties of a deal have greater intention to cheat, because they are not experiencing any losses due to the lost future income flow. Both parties of a contract are risking only on the current value of a deal in these conditions. This value can be increased taking advantage against other party of the deal. For example, the supplier can deliver goods of low quality, when the payment method is irrevocable letter of credit, paid upon receipt of the delivery. However, if the game repeats,

the payoff is distributed across the whole time of the game (Dixit, Nalebuff, 2008). Therefore, cheating in current situation can have negative impact for future deals. In other words, if a supplier delivers low quality goods, the buyer can neither accept other goods, nor pay for them. Due to this reason, equilibrium of co-operation is characteristic in a repetitive Prisoner's dilemma (position CC, Figure 16). According to Eriksson (2007) and Szolnoki et al. (2008), this explains the establishment of contemporary long-term connections tendency between the suppliers and the buyers.

The transaction costs are very important factors in seeking for co-operation in case of Prisoner's dilemma. The transaction costs in this case mean financial and time management costs, in the process of negotiation and agreement, including the costs of terms' observation for the deal, its implementation and control (Marren, 2011; McCain, 2014). The transaction costs are usually bigger, when acquiring the goods from a supplier, who is abroad, rather than from a local one. Foreign suppliers tend to take advantage against such buyers, who face bigger transaction costs in case of Prisoner's dilemma (Eriksson, 2007). This is one of the reasons, why joint supply channels are developed in imperfect markets. Theoretically, the transaction costs could be treated as the costs of downturn and these should be ignored when making future decisions. However, even though a stable agreement is reached, treating fixed costs as downturn costs, it is often impractical. The managers of the companies, who invest time and money, seek to gain benefit from these investments. Therefore, they are very motivated to make a deal. Faure et al. (1990) proved, that social-emotional background is characteristic in negotiations. The foreign supplier can use this background as a benchmark to gain benefit from negotiations.

1.5.2. Strategies, allowing to improve relationships between the buyer and the seller

According to Reardon and Hasty (1996), business companies should choose one of the following four strategies, in order to increase the probability to create co-operative relationships between the seller and the buyer, in case of Prisoner's dilemma:

- Change of payoff function;
- Splitting of purchase;
- Raise of qualification;
- Reduction of contract costs.

The strategy of changing payoff function means that, when making a deal, the payoff function is modified in such way, that it does not satisfy payoff function of

Prisoner's dilemma anymore. As overviewed in subchapter 2.4.1, the equilibrium of Prisoner's dilemma is the decision not to co-operate (Eriksson, 2007; Svensson, 2010). However, if the buyer will be able to modify current structure of priorities, the rules of a game can change. According to Eriksson (2007), the optimum decision for the buyer is to change the priorities of the seller and at the same time keep own priorities stable. However, according to the most of the strategies, the buyer must adapt, in order to get any responsive discounts. If a buyer or a seller does not change the priorities voluntary, and the priorities of the counterparty remain stable, the expected result of a game is asymmetric co-operation, the term is known as *game of bully* in scientific literature (Marren, 2011; McCain, 2014). It is a situation, when one of the agreement parties is always taking advantage against other and there is no chance that this position will ever change (Marren, 2011; McCain, 2014). The buyer has to modify his priorities or both counterparties must do it.

In the case of simultaneous priority change, the buyer can be forced to change his priorities even when the seller does not intend to do the same. However, this choice is not optimum, because the buyer can become vulnerable and the seller will get an opportunity to take advantage against the buyer. As seen by McCain (2014), only when the distribution of power is in a such way, that a buyer can maintain high or moderate level of control, such decision can help to encourage co-operation between the parties. To change the priorities from one side is the easiest, when the cost of failure to comply with the terms of the agreement increase for the buyer. Such costs can be increased, for example, when placing own property as a collateral for the agreement. Collateral would modify the buyer's payoff function, however the payoff function of the seller would remain stable. It would be beneficial for the seller to take advantage against the buyer in such a situation. Even though such strategy is not quite recommended, the combination of it with other strategies, described further, can increase the probability of co-operation.

In the case of mutual change of priorities, various conditions could be included into the purchase contract, which would enable the change of the priorities for both counterparties. What is more, both counterparties can place their property as collateral, to assure the conditions of the contract will be executed. If both agreement parties place their property as collaterals and the value of this property is higher that the possible benefit from cheating, the choice to cheat loses its attractiveness. However, to freeze capital and reserves is not always attractive for business companies. The use of a third-party participation (for example audit firm, purchase agent, importer or other intermediary) can also encourage co-operation. In such way, part of the risk for non-compliance with the agreement terms is transferred to the third party and can be also assumed as a potential ben-

efit for the agreement. However, in this case it is very important to make sure, that the cost of transaction will not increase too much.

Talking about the change of priorities, it is noted, that the change of any priority with other, which does not encourage mutual co-operation, will not help neither the buyer, nor the seller. However, there are priorities, which can help to change the equilibrium of co-operation in case of Prisoner's dilemma. Such priorities and their equilibrium are overviewed in scientific literature:

- *"Stag hunt"* equilibrium (Rankin et al., 2000; Rydval, Ortmann, 2005; Pacheco et al., 2009; Wang et al., 2012 and other.);
- Game harmony (Zizzo, Tan, 2002; Camerer, 2003; Zizzo, 2003; Roca et al., 2006; Paternotte, Grose, 2012 and other.).

It is important to describe these equilibriums further in detail.

The payoff function, which is created by "Stag hunt" priority is denoted the following CC > DC > DD > CD (see Figure 16). In this case, the lowest payoff (position CD) is present, when the advantage against counterparty is used. The highest payoff is received, when the buyer and the seller co-operate. This means that "Stag hunt" equilibrium is co-operation, except the case, when one of the contract parties believe, that the other party will cheat. Only in this case, the party, who expects cheating from the counterparty, will strategically behave in such way, that it would be possible to avoid the least payoff position (position CD). Usual equilibrium of Prisoner's dilemma can be modified to "Stag hunt" equilibrium, changing usual payoff from DC > CC to CC > DC.

In the case of harmonious game priority, the equilibrium is denoted the following CC > CD > DC > DD (see Figure 16). When this condition is present, any party of the contract will continue co-operation despite the actions of another party. In this way, if both parties admit, that this function is a mutual priority, co-operation will be the only result of such a deal. As noted by Reardon and Hasty (1996), it is difficult to achieve the equilibrium of harmony game, except in conditions of coercion. In order to change the initial payoff function of Prisoner's dilemma the order of positions should be changed. By the way, the priority of position CD has to be increased in such way, that it would be far ahead of all other priorities, except for the position CC priority. So, even though harmony game strategy is effective, it is most difficult to achieve, when seeking for the co-operation in business. As noted by Paternotte and Grose (2012), harmony game allows to take advantage of a counterparty, even when there is no response from other party. This situation is possible, when a buyer or a seller has a big power in the market. For example, if the seller is a monopolist or he has a cartel agreement with other big player, the buyer retailer will have a very low possibility for co-operation.

Iteration strategy means, that one purchase can be divided into couple of smaller ones within the same contract (Sanfei et al., 2003; Perc, Szolnoki, 2008; Dixit, Nalebuff, 2008; Johnson et al., 2011; McCain, 2014 and other.) According to Perc and Szolnoki (2008), it is one of the most effective methods to encourage co-operation and reduce the possibility of failure to comply with terms of a deal. As noted before, in the case of Prisoner's dilemma, the decision for stable co-operation can be achieved, when the game is repeated many times (Perc, Szolnoki, 2008; Dixit, Nalebuff, 2008; Johnson et al., 2011 and other). The more times the game will be repeated, the more stable co-operation can be expected. The payoff function is the value of future earnings (Dixit, Nalebuff, 2008), the benefit, received, when breaching the terms of the deal, has to be higher than discounted future benefit, also received, when breaching the terms of the deal. The more times the game is repeated, or in other words, the bigger future benefit is, the lower possibility of breaching the terms of the deal occurs (Perc, Szolnoki, 2008). Repetitive games have also impact on the decrease of contract costs and information gathering. The simplest way to increase the number of repetitive games is to buy lower amount of goods in several times. The timeframe of the deal remains the same, however one big deal is divided into several smaller ones (Mailath, Samuelson, 2006). The execution of previous deal is a requirement for the execution of proceeding deal for both counterparties. This situation seems to be stable enough from the first place, because any discrepancy can end the deal. However, as noted by Camerer et al. (2002) and Johnson et al. (2011), such deal is much more stable than a simultaneous deal, because both counterparties of the deal are interested in the development of co-operation.

For example, if a buyer orders a shipment of clothes for 1 million euro from the seller, the amount of the contract is relatively high for both counterparties. Therefore, the losses of this deal would also be high for both counterparties, if one of the parties decided to cheat, especially, if the response actions have been limited for the other party. However, if the order was divided into several smaller orders, for example 100 orders, where each of the order is worth of 10 000 euro, the highest benefit, which could be received through cheating, would be equal to the value of one order, 10 000 euro, because after such case the other party would disagree to continue paying and cancel all the following orders. It is meaningful to maintain the value of future payoff for the buyer and the seller. When both counterparties admit, that future payoff is realistic, they are interested to continue co-operation. The limitation of this strategy can be discovered only at the end of the deal, when discounted future payoff is lower than the possible benefit from cheating. However, as stated by Johnson et al. (2011), the co-operation can be continued for unlimited time in this situation, if both counterparties agreed to reveal each other's cheating. A new game is started in that case. However, cheating from any parties of the deal, like the forgiveness for cheat-

ing, will have impact for future payoff. For example, if the seller decides not to deliver ordered goods on time to the buyer, and the buyer discloses this information about the seller in public, the future value of the buyer will decrease, because the seller will no longer want to provide the goods to him. However, if both counterparties agree to announce positive opinion about each other in public at the end of the deal, the payoff value for both counterparties will increase, because in this way they will increase each other's reputation in the eyes of potential customers. So, the distribution of positive and negative information in Game Theory is one of the moving powers for termination or continuation of a game. It is called *reputation effect* in scientific literature (Roberts, Dowling, 2002; Haoping, Wei, 2007; Yan et al., 2011; Shu et al., 2011 and other).

However, while analyzing the application of iteration strategy in practical business decisions, it must be noted, that this strategy can have a slightly different effect due to cultural differences between the contract parties. For example, the disclosure of negative opinion about the opponent in public can be acceptable and attractive, and even act as a public advertisement campaign for the latter, despite the potential business losses. By the way, if a company has liquidity problems, faces financial difficulties, iteration strategy cannot be affective, due to the lack of turnover, the company is not planning big orders, even when the possibility to split them exists. Such company is more oriented into short-term value, rather than to the long-term one, and according to Perc and Szolnoki (2008), the immediate benefit of limited value for such company rises. If this value becomes higher than the value of future payoff, the possibility increases, that such company will cheat, when facing the financial difficulties: companies, which lack turnover, can start ignoring the terms of the deal and seek to improve its current status, despite the costs in long-term.

Qualification raise strategy means, that the buyer can acquire more skills and knowledge on how to act in international markets, avoid cultural differences and become less vulnerable party of the contract. Qualification raise strategy is useful, when one of the players knows, what the other player does not know. According to Anot Dixit and Nalebuff (2008), in some cases the player, who has information, is willing to conceal it, so called *"hand in poker"* strategy, and in other cases he wants to reveal that information, so called "*commitment to quality"* strategy. In both cases the main principle is that the actions of the players say more than the words. Willing to conceal the information, the player most often will change and confuse his actions against other players (bluffing is not required to be systematic in poker), and when the player is willing to reveal the information, he will take such actions, which would give a reliable signal to other player *(for example, extension of warranty term is a reliable signal to the consumer, that the company trusts in the high quality of its products).* Accumulation of new information can

change the priorities of a buyer and modify payoff function, because according to McCain (2014), having imperfect information, the players are not aware of that the initial equilibrium and initial payoff function, in the case of Prisoner's dilemma, can be modified in their favor. By the way, the counterparties of an agreement can have misleading or partial information, which could change equilibrium of Prisoner's dilemma in favor of counterparty.

The essence of *Reducing contract costs strategy* is to reduce contract costs. Co-operation with the same business partner allows to reduce the costs of negotiations regarding the contract significantly and eliminates the costs of search (for example, the buyer does not need to search for a new supplier each time). The costs of negotiations are reduced, because certain norms of co-operation, developed between both counterparties in long term (for example, the supplier knows, what requirements are for goods, their packaging and delivery from the buyer, what are the terms and forms for payment; the buyer knows what quality goods he can expect, when the goods will be delivered; both counterparties can refer to previous contract, when more than one contract has been signed between them in the past and save their time and money on consultations with the lawyers). Established conditions of co-operation (rules of a game) allow to reduce not only the costs of the contract, but also the level of uncertainty. According to McCain (2014), this has a positive impact for the competitiveness of a company in the market.

The buyers can reduce the costs of a contract forming the groups of a purchase, co-operating with other buyers, and providing joint order or orders, when the orders from separate groups purchases of smaller volume are combined into one big order. Buying in groups minimizes the supply costs for the members of such groups, because the costs of such contract are distributed among the group members. Even though the interests of participating companies in a group can differ, they all can get benefit, having united available information and other resources.

However, as Dixit and Nalebuff (2008) state, that forming purchase groups can have some drawbacks. Firstly, the costs are incurred, while forming and maintaining such groups, and they reduce the amount of expected benefit. Secondly, based on *the Theory of Collective Action*, it is difficult to co-operate for the groups, which consist of the members with different interests (Kuhnert, 2001; Smelser, 2011; Ostrom, 2014). Even though, as Ostrom (2014) states, the interests of companies, which form purchase groups, are relatively homogeneous, the problems can arise due to the strategic goals of such companies. Therefore, other game can start inside of such groups.

Summary: *earlier covered theories, such as the change of payoff function, splitting of purchase, raise of qualification and reduction of transaction costs, according to Reardon and Hasty (1996), are adapted to local and international business channels, based on political economy studies. Therefore, each of the strategies can be used in order to mitigate the conflict of interest between the buyer and supplier, who operate in different countries. What is more, even a better result can be achieved, when separate strategies are combined and a joint buying-selling strategy is formed.*

1.5.3. Development of co-operation when changing the matrix of a strategic game

Even though the main object of Game Theory is situations of conflict of interests, and negotiations are not always the alternative or preferred option for the players, when each player is trying to defend his own interests, however, co-operation and mutual agreement is always better that no agreement at all. As Kippenberg (1998) visually states, each player must find a compromise between the wish to get the bigger part of a pie and the wish to share that pie among others.

The idea, how the rational players should look for the ways how to co-operate and be able to do it, raised Luce and Raiffa in 1957. Later the problems of long-term co-operation have been analyzed deeper by R. J Aumann (1959), who is treated as one of the first researchers of long-term co-operation. According to Aumann (1981), it is easier to co-operate in any game, when not only a contact relates the players, but long-term relationships are maintained for a while, as big part of mutual interaction between people in real life is of unlimited duration (relationships with neighbors, colleagues at work, constant business decisions for company management, production, or marketing). Aumann (1981) has proved, that co-operation is also possible, when a game contains very big conflicts of interests. It is important that the conditions, necessary for co-operation, would be executed:

- The players should meet and communicate between each other;
- The number of the players should not be too big (when there are too many players, there are less possibilities to meet each other constantly, therefore the bigger opportunity is that their interaction sooner or later will be discontinued);
- The timeframe for co-operation should not be too short (it is difficult to make qualitative long-term relationship quickly);

- The actions of participating players should be possible to predict (in the cases, when it is not possible to predict one player's action or actions, the other players might feel discontent and their relationship will be discontinued).

Abreu (1988) later complemented these conditions and denoted optimum penalties for the players, who do not keep to the rules of a game and proved, that limiting the possibilities to the players to cancel their commitments, the equilibrium of game winnings lot can reach socially active lot. The application of penalties, as an effective tool for communication maintenance in a game, has been analyzed by Gilgeous and D'Cruz (1996), da Costa et al. (2009), Ozdaglar (2010), Bhalla (2013), McCain (2014) and other.

Conducted researches by Aumann (1959, 1981), Abreu (1988) and other scientists about the co-operation opportunities in conflict of interest situations allowed to explain economic conflicts between economic subjects, countries and regions, also justify the development of communities in some regions, background establishments of international institutions and trade unions (Greif et al., 1994; Maggi, 1999; Dixit, 2003; information from Lithuanian Bank academic journal "Monetary Studies", 2006; McCain, 2014 and other).

The authors Alvard (2002), Zhang et al. (2007), Jones (2007), da Costa (2009), McCain (2014), Olgun et al. (2016) and other have researched the tactics of co-operation between the players, which can be applied in order to change the classic game matrixes and expect better results for themselves and the opponents, rather than those results, which could be achieved, when acting without any agreement. Of course, to achieve the best results for a group of players rather than for an individual player is complicated, and this is one of the reasons, why seeking for mutual co-operation, two or more decision ways can be present in a game. The following question should be answered in co-operative games: "What strategic choice will bring the biggest benefit to all participating players, in case they choose a common, coordinated strategy?"

As noted by McCain (2014), grown up people get into co-operative games every day, because even a regular buying or selling is a co-operative type of game. *For example, Tom has a bike, but he really needs money. He evaluates that his bike is worth of 80 EUR (setting value in economy is based on a subjective opinion; in this case Tom evaluates his bike in a certain amount, which can be spent on acquiring any other thing, which he needs more). Paul has 100 EUR, but he has no bike and is willing to buy it for 100 EUR. Both players have the following choices: Tom can sell the bike or keep it; Paul can exchange his money for the bike or keep the money. Even though the strategy "keep-keep" is dominant strategy of this game, when the game is analyzed as non-co-operative, however the strategy "give-give" provides*

more expected value for both players. The bike is less valuable for Tom and the money is more valuable for him, whereas money is less valuable for Paul than a bike. When Tom and Paul agree on the deal, they form a coalition: they are obliged to keep to coordinated strategy and acknowledge the strategy "give-give" as a joint strategy of their coalition. In the games with more participating people, more possibilities to make coalitions exist. Even though coalitions can be made in non-co-operative games, the absence of meaningful commitments make such coalitions weak. Possible price setting range can be impacted by the following aspects:

- Competitive pressure from other potential buyers or sellers (if Tom gets other offers to buy his bike, he could raise the price of the bike);
- Perceived justice (Tom thinks that the price is reasonable, because the bike has been used);
- Negotiations (Paul can decide to ask Tom to reduce the price of the bike and Tom will consider whether to agree with Paul's arguments or not).

Another example of co-operative game, provided by McCain (2014), is a game with real estate, where three players and a fourth party participate, the latter is not a player, but a businessman, who wishes that the players make a coalition. Suppose, this businessman is a real estate agent John, who wishes to unite the property of three owners, Kristina, Laura, and Marius, to be able to sell all their real estate property as one common property package. The deal would be stable only when none of the property owners wished to negotiate with the real estate agents. Therefore, John starts to analyze deeper, what are the possibilities to make a coalition for all three property owners and what possible their payoff is. All possible ways of making a coalition and their payoff in every case of a coalition in the scale from 1 to 10 is shown in Table 4.

Table 4. Examples of payoff in the creation of real estate property coalitions

No	Coalitions	Payoff
1.	Kristina, Laura, Marius	10
2.	Kristina, Laura	7
3.	Laura, Marius	7
4.	Kristina, Marius	6
5.	Kristina	3
6.	Laura	3
7.	Marius	3

Source: compiled by the authors with the reference to McCain, 2014, p. 382.

The first line in Table 4 shows the coalition of all three property owners (K – Kristina, L – Laura and M – Marius) and their payoff. In the terminology of Game Theory such coalition is called Grand coalition (Shah, 2009; Wexler, 2009; Muenchberger et al., 2012; Munyon et al., 2014). In the second, third and fourth lines of the table the coalitions of any two property owners is shown. Finally, the fifth, sixth and seventh table lines show the real estate owners, who act individually (in other words no coalition is present). Based on the data from Table 4, grand coalition can bring more benefit for all the players, rather than the strategy to act individually. This acts as the biggest motif for the stability of coalition. If benefit, received from grand coalition is lower, than from pair coalition, or from acting individually, then grand coalition will fall apart or will not be made at all.

However, it is not clear from the example, what is the contribution of each player to create benefit in a coalition and how that benefit is distributed among the coalition members. The application of Shapley value method helps to identify this. The method was firstly introduced by Lloyd Shapley (1953), and the method was called by his name. Based on Shapley method, a unique common surplus exists in every co-operative game, created by game coalition, and distributed among the players (Hubert, Ikonnikova, 2003; Reyes, 2006; Huber et al., 2012; Shorrocks, 2013 and other). Some players can contribute more to the success and benefit of the coalition than others, or some of the coalition members can have a bigger negotiation power than others (for example, can threaten to leave the coalition). How important coalition is for every player? How received benefit from the coalition should be distributed among the players and what reasonable benefit can each player expect? Shapley value provides a possibility to get the answers to these questions. Shapley value is based on the assessment of player's limited contribution to the game. Shapley value from a game for the real estate property owners – Kristina, Laura and Marius is shown in Table 5.

Table 5. Example of Shapley value in real estate property coalition

Player / Coalition	K	L	M
K, L, M	3	4	3
K, M, L	3	4	3
L, K, M	4	3	3
L, M, K	3	3	4
M, K, L	3	4	3
M, L, K	3	4	3
Average mean	**3,17**	**3,67**	**3,17**

Source: compiled by the authors with the reference to McCain, 2014, p. 390.

Suppose, Kristina, Laura and Marius have joined the coalition in this particular order. So, Kristina (K) started to form coalition first, her value added was equal to 3. Later Laura (L) joined the coalition. Since the common value of coalition (K, L) is equal to 7, it means, that Laura's value added is equal to 4. Marius (M) joined the coalition the last one. Since the total value of coalition (K, L, M) is equal to 10, it means, that the value added by Marius is equal to 3 in the coalition. According to Shapley value, the payoff of every player is based on each player's input they bring to the coalition, therefore the payoff for Kristina, Laura and Marius is equal to 3, 4 and 3 respectively. It is noted, that the sequence of coalition making K, L, M is negotiable. For example, Kristina could join the coalition as a second person. Then her value added to the coalition would be equal to 4. Therefore, performing the analysis of Shapley value, each player's input and payoff from a game is calculated based on the order they have joined the coalition.

In order to analyze Table 5 according to players' possible order of joining the coalition, pay attention to the 4th row in the table. The players have joined the coalition in the following sequence: L, K, M. Since L has joined the coalition first, her limited input to the coalition value is equal to 3 (this is reflected in the 3rd column of the table). Further K has joined the coalition and became coalition (L, K), the common value of which is 7. It means, that limited input that K brings to the coalition is equal to 4 (this is reflected in the 2nd column of the table). M was the last one who has joined the coalition and finally Grand coalition was formed, the value of which is equal to 10. It means that limited input that M brings to coalition value is equal to 3 (this is reflected in the 4th column). Shapley average value of the players K, L and M is equal to 3,17, 3,67 and 3,17, accordingly, in this game.

To sum up, despite the conflict of interest situation, the players have the possibilities to achieve co-operation between themselves, which, according to many scientific researches, usually brings more value to the players, than an individual game, because the strategic game matrix is modified through the co-operation and in this way the strategic equilibrium of the players in the game changes as well. Co-operative game theory allows to explain many aspects of various economic behaviors, however, it is more difficult to maintain co-operation, when many participants are present in a game and they do not communicate between each other, when the timeframe for co-operation is too short or when the behavior of one or another player is unpredictable. Price and trade wars, economic and social conflicts between business subjects, countries and regions are associated with the failure to keep to the previously named rules. Whereas the legal implementation of the named rules and their practical application explains the establishment and functioning of cooperatives, trade associations, coalitions, and many international economic and trade institutions (World Trade Organization, World Bank, International Monetary Fund and other).

Summary: *in general meaning, the development of Game theory allows to find optimum decisions, when acting in uncertain environment, which, in no doubt, is business environment. The improvements of Game theory within the last decades can help the business managers to achieve set results and accurately choose strategies in specific conflict of interest situations. Once some advantages are noticed to act in local and international markets, the business managers are willing to look for more favorable development opportunities and this positively impacts the development of economy in a country. However, Game theory is not yet fully covered: there are situations in real business world, which do not fit into the theory frames, therefore the choice of a successful business strategy is a real art in most of the cases.*

2. STRATEGIES OF GAME THEORY

Business subjects of various size, power, and structure, who act in a market, face many practical situations, when the final goals of interacting subjects are not clear and decisions are not easily understandable. Companies, who make a contract, often have different interests, and choose different behavior models. However, even acting in such uncertainty conditions, business managers have to make decisions hoping, that these decisions will bring as much benefit as possible to their companies. Paying attention to the volatility and uncertainty of business situations, it is recommended to assess possible decision favor or disfavor to the company, according to average expected impact. With this goal a simplified situation model is created, called a game. The object of Game theory is general analysis of subject strategic interaction. In other words, based on Game theory, various modelled strategies are used, which allow to find equivalent between the behavior of partners in a game. The strategies of Game theory help to analyze various possible variants of a decision and choose the one, which is the most favorable in a certain situation. The types of strategic dependencies and mathematical equilibrium, according to Game theory, are analyzed together with positions of the players in typical game situations, and the main strategic forms of players' interaction are overviewed in this chapter.

2.1. Types of strategic dependency

The essence of a game is mutual dependency of players' strategies. Dixit and Nalebuff (2008) have distinguished the following types of strategic dependency:

- sequential strategy;
- simultaneous strategy.

In case of sequential dependency strategy, the players act in sequence, knowing about each other previous actions. The main principal, based on which the player makes decisions, who choses sequential strategy, is to make future decisions, paying attention to the causes from the past. (Dixit, Nalebuff, 2008). Each player has to understand, how other players will respond to one or other specific action, and how that player will respond to responsive actions of other players. The player has to foresee, where his primary decisions will lead him to, and use this information for the choice of the best possible scenario (Pehrsson, 2016). In this way, linear chain of actions, which is based on previous actions from the past, is built. This means, that any sequential strategy game can be totally completed only when

the exhaustive number of actions will be accomplished (Canales, Vila, 2005). What is more, as Lifang and Hongzhuan (2012) states, the structure of choice time is a very important aspect in sequential strategy: first of all one player performs an action, based on which other players perform actions, which means that, when the second player makes his choice, he already knows, what is the choice of the first player.

One of the examples of sequential strategies is called **Stackelberg model** (created by German economist Heinrich Freiherr von Stackelberg in 1934) where one player is a leader, and the other is the follower (Wang, Wang, 2010; Lifang, Hongzhuan, 2012; Shi et al., 2016 and other). Based on this model, a business company, which is the leader in the market, performs the first step. Then other companies make a responsive step, based on the actions of the leader company.

Of course, people can get involved into Stackelberg competition, if one of the competing companies foresee the possibility to use advantage of making certain first step. Such examples can be found and in Lithuanian oligopoly markets. *For example, an aggressive price fight has been on between the major Lithuanian mobile communications companies until 2013: "Tele 2", "Bitė Lietuva" and "Omnitel". Mobile network operators have been searching for various ways how to attract customers, mobile connection plans have been improved in most cases, monthly fee has been reduced, rate for calls and SMS has been also reduced, free online data transmition amount has been increased through the application of aggressive advertisement campaigns. The talks have been on, that the limit of price reduction has been reached, and they are the best in all European Union. However, the limits of opportunities have not been reached yet. In 2013 the company "Bitė Lietuva" has challenged other mobile operators offering unlimited calls and unlimited SMS for a fixed monthly rate of 22 litas. The competitors have been forced to make responsive actions immediately. The first company, who reacted to the challenge was "Tele 2", which immediately has offered the same conditions for the customers for a fixed monthly rate of 21 litas. As general director of company "Tele 2" Petras Masiulis has stated, not much calculations have been done, while releasing this offer to the market. The company had to immediately react and take responsive actions, assuring attractive conditions for the customers. So, the reaction of "Tele 2" was provoked by the decision of company "Bitė Lietuva". The reaction of company "Omnitel" has been slightly delayed. However, a similar offer with similar price has been released to the market. The initial benefit of the decision belonged, without any doubts, to company "Bitė Lietuva". Currently all three mobile connection operators offer plans, according to which unlimited calls and SMS are provided for a fixed monthly rate and a different rate is applied for online data transmition amount. The competition is created not through the prices, but though the increase of customers' loyalty, expanding the network coverage, quality of connection and data transfer speed.*

However, as Wang and Wang (2010) state, there are many obstacles to reach the interest equilibrium of the players applying Stackelberg model. Firstly, company-leader must know in advance, that other companies (players) watch its actions. Secondly, other companies should not have the possibility to choose any other actions, but the response to the leader's actions and the leader must know about it. Thirdly, the leader must have the power of commitments, which means that if a specific decision or action is made, it is committed to this decision or action and there is no way backwards. As noted by He et al. (2007), acting as the first player is possible, if for example, the leader is a monopolist in a market, and the second player is a new participant in a market. However, in business practice the coincidence of all these conditions is very rare. What is more, there are cases, when one player knows the choice of other player even before the choice is made. In such case, he can modify his actions in advance. And on the contrary, one player can only threaten to take certain actions and the second player can treat this as real intentions, even when in reality the actions of the first player can differ from threatening a lot. Or the second player would not trust the threatening of the first player and keep to the strategy as no threatenings were present from the first player. In other words, the player, who first makes a choice, expects rational responsive actions from the second player, however these actions are not always performed. Therefore, sequential strategy can be applied in simple games only (for example in a game of crosses and zeros). However, many complex calculations are necessary for the majority part of other type games (even when IT technologies are used for it), in order to foresee the finite number of actions. Due to this reason the players try to anticipate couple of actions in advance, and based on the experience, assess the consequences of such actions.

In case of simultaneous strategic dependency, the players act at the same time, without knowing about each other's decisions or actions (for example, two companies make decisions independently from one another, whether to increase the price of a product or not). On the contrary to sequential strategy, in linear sequence of the actions, which follow each other, the actions in simultaneous strategy form the circle of logics. Even though the players act at the same time, despite the actions of each other, each of them must know, that other players are present in the game, who are aware about other players as well and so on. According to Dixit and Nalebuff (2008), the players, who choose this strategy, think the following: "I believe, that he believes, that I believe…". Due to the reason, that no information is available about, what other players choose, it is assumed, that the strategic choice, which is available for each player, is known to all other players. So, the player must think not only about the best strategic decision for himself, but also about that, what the best strategic decisions could be applicable for other players as well (Dixit, Skeath, 2015). Figuratively, each player should imagine

himself in the shoes of other player, and try to foresee the results. However, even the same player's actions become a component of common assessments in a circle of logics. This circle of logics is closed, applying John Nash, mathematician from Princeton University, concept of equilibrium. The players search for the choice set (one player has one choice), that every player's strategy would be the best for him, when other plyers search for their best strategies (Dixit, Skeath, 2015). However, as Brocas and Carrillo (2014) noted, sometimes the best choice does not depend on what other players do, there is one strategy out of many possible strategies, which as is expected, can bring the most benefit to the player, regardless of what actions the other players will take. This strategy is called *Dominant strategy* (Dixit, Nalebuff, 2008; Sonmez, 2013 and other). If the players can choose from couple of strategies, then it is necessary to look for their equilibrium, while trying to identify, what strategy the player is going to choose, thinking rationally. The search for the equilibrium is started though the elimination of the strategies, which are the least rational and which, as expected, the player is not going to choose.

However, it is said, that to reach equilibrium in a specific game, no guaranties are present, that each player's individual choice will help to reach optimum result for all the players. There are strategies in Game theory (for example Prisoner's dilemma, which is described in 2.4.1 subchapter), when other players incur unwilling consequences, each seeking for the best individual result for himself, even though acting together, they could reach even better results. According to Dixit and Nalebuff (2008), Nash equilibrium is an unfinished solution of a problem in case of circular reasoning, within simultaneous actions strategy.

Summary: *the most common dependency types in Game strategy – sequential and simultaneous, are present in Lithuanian market (services of mobile network operators' market). Stackelberg model is the most popular in sequential strategy, and dominant strategy model is the most popular in simultaneous strategy. Named model conditions in business are not always established, because Game strategy itself, tactics and responsive actions of competitors can change immediately and depend on a specific impact of environment (political, economic, cultural).*

2.2. Equilibrium of mathematical game strategies

As has previously been mentioned in the introductory part of the monograph, the main problem, while applying the principals of Game theory in business is: *what game business subject should choose now?* Even though in scientific literature (Gnyawali et al., 2006; da Costa et al., 2009; Bengtsson et al., 2010; Brandenburger, Nalebuff, 2011; Gnyawali, Park, 2011; Jadlovska, Hrubina, 2011; Myerson, 2013; Bengtsson, Kock, 2015; Alves, Meneses, 2015 and other) often is noted, that business companies can choose competitive, co-operative or co-opetition game and it is important to identify, what game will be strategically rational for the company in its business environment in each situation of conflict of interest. Therefore, before creating the matrix of strategic game and calculating possible equilibrium of game strategy, the authors da Costa et al. (2009) offer business companies to reply to the questions about possible behavioral models, their level of power, type of a game and expected consequences of a game (see Table 6).

Table 6. Problems and questions, which must be formulated before creating a game matrix

Problem	Question
P1. Co-opetition theory assumes that competition and co-operation are only two behavioral models, which ground the player's decision on which game to choose.	**Q1.** Are competition and cooperation in fact the only two possible behavior models, that business managers should consider before deciding, what type of game to choose?
P2. Co-opetition model does not take into consideration the player's power level.	**Q2.** Does the player's power level determine the type of a game the player and his opponents will choose?
P3. No models are detected in scientific literature, which could identify, which game, described in classical Game theory, can be effectively applied in every situation of conflict of interests, arising between business companies.	**Q3.** What type of a game, from the mentioned options, denoted in classical Game theory, the business managers should choose in every situation of conflict of interest, that they face in business.
P4. Is the player, who chooses the wrong game, always experiencing only the negative consequences?	**Q4.** What consequences can the player expect, when choosing wrong game in a certain conflict of interest situation?

Source: da Costa et al., 2009.

As seen from Table 6, before entering a game business companies should consider the possibility, that competition, co-operation, or co-opetition models are not enough in order to reflect conflict of interest situation appropriately, which the company has faced.

Summary: *it is recommended to look into a future game from a broader perspective, adding such additional dimensions as power level of participating players, type of a game and consequences according to optimistic and pessimistic scenarios. What is more, in order to perform deep analysis, it is appropriate to assess the players' attitude (posture), behavior and actions, which they have taken in previous situations of conflict of interests. Having assessed named actions, a strategic game matrix can be formulated.*

2.2.1. Structure of strategic game matrix

Strategic game matrix is a descriptive conceptual model, which is designed to ground the decisions of company's managers in various business interests in conflict situations (O'Connor et al., 2014). It allows to classify, identify, and characterize possible games and thus helps to determine the correct game strategy in each game. Using strategic game matrix, business managers can identify, whether their chosen strategy is not connected with possible low results of a game and assure, that the expectations for the game and its results will match. In other words, strategic game matrix simplifies the analysis of potential game situations, and also helps to properly assess the actual and potential loss or business failure risk, which can appear in each game. Using game matrix, the business managers can:

- identify any conflict of interest situation and treat it as a unique, having in mind that, usually there is no standard solutions to such situations;
- assess the level of power in your company in every situation, comparing with other players' level of power, and make decisions, based on the objective level of power in your company in every situation;
- examine the actual situation in each case of conflict of interest and decide whether or not to trust the opponents' good faith and loyalty; and based on that decide, whether or not to co-operate with the competitors;
- objectively determine which game strategy the company should chose in each case and apply this strategy, despite the subjective guesses or subjective feeling.

Preliminary version of strategic game matrix concepts and structure was introduced by authors da Costa and Bottura (2004), later this structure has been im-

proved (da Costa et al., 2006a, 2006b; da Costa, Bottura, 2007; da Costa, 2008 and other). In order to formulate a strategic game matrix, these classical Game theory assumptions are followed:

- A player is considered to be a person, who makes decisions acting individually or in a team, and understands the opportunities and risks of a game, makes decisions, and implements them.
- The players behave in this way knowing, that their decisions can bring a specific risk and uncertainty, also make positive or negative impact on the achieved results of all participants of a game.
- The players always take into consideration, that they cannot control the decisions of opponents, even though these decisions may impact their own results in a game.

In scientific literature (da Costa, Bottura, 2007; da Costa, 2008; da Costa et al., 2009) two main strategic game matrix dimensions are distinguished, which characterize a game:

- Power of player's negotiations (real and perceived) in a specific game.
- Player's posture, the connections between the player and his opponents, including the players' point of view towards competition and co-operation.

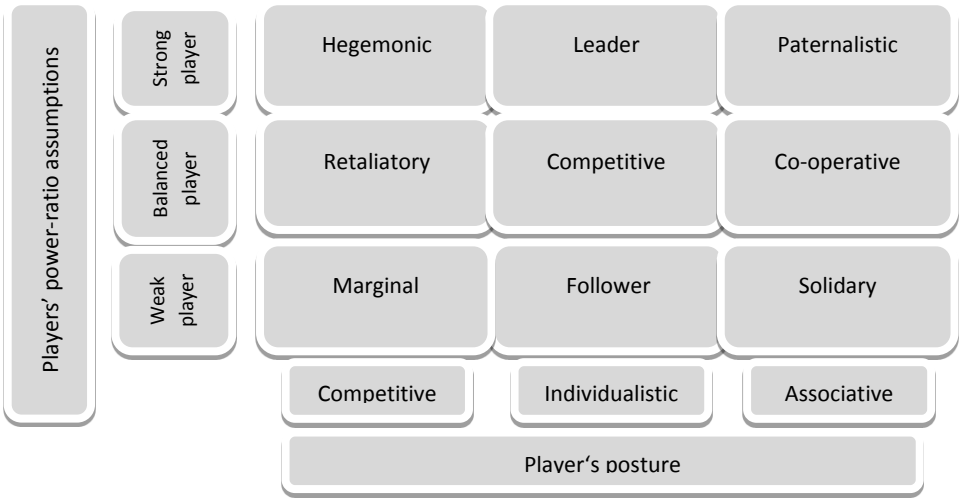

Figure 5. Strategic game matrix

Source: da Costa et al., 2009, p. 143.

Strategic game matrix is formulated combining three players' posture assumptions (competitive posture, individualistic posture and associative (co-operative) posture) and three levels of negotiation power assumptions (weak player, balanced player, and strong player) (see Figure 5).

As seen from Figure 5, strategic game matrix consists of nine windows (3 vertical windows and 3 horizontal windows) matrix, where vertical dimensions reflect three possible players' power levels (strong, balanced power and weak), and three horizontal dimensions reflect competitive posture (competitive, individualistic, associative). Nine windows of a strategic game matrix reflect nine possible game situations, which business companies usually face. Each matrix window is a typical strategic game situation. Five player's postures, showed in the center of matrix, competitive, leader, follower and co-operative, reflect five classical game theory situations.

- *Competitive strategy*, when a player acts in a perfect competition market, where multiple goods and services providers and buyers are present, and one single player cannot be dominant against others;
- *Leader strategy,* when a player acts in a monopoly market where practically no competition is present, therefore the player has power to set the rules of a game (for example to set the prices for goods and services to the providers and buyers), in oligopoly or imperfect competition markets, where a player covers big part of a market and is able to set his conditions to other players;
- *Follower strategy*, when a player acts in an imperfect competition market, where one or few big players are present among other smaller players, therefore a player has low power in a market and cannot force the opponents to act according to his interests and before making strategic decisions, is willing to wait and see, what actions the stronger competitors will take;
- *Responsive strategy,* when a player acts in oligopoly market or in perfect competition market and has enough power; this player can take responsive strategy as a reaction to other players' actions, who are bigger or have the same level of power;
- *Co-operation strategy,* when a player acts in oligopoly or perfect competition market, and has the same power as his competitors, however he is willing to co-operate, rather than to compete with the opponents, seeking to achieve common goals and results, which would be beneficial for all sides.

However, as noted by Costa et al. (2009), acting in real market conditions, situations occur, which do not match any named strategies of classical Game theory. Four corner situations (see Figure 5) are not explained by classical Game theory models. Despite that, the authors da Costa et al. (2009) suggest to pay attention to them as to possible real situations in business area, meaning real player's power of negotiations and his posture relationship. So, the authors indicate, that in rare cases, deviating from standard situations, the players can keep to the following strategies:

- *Hegemonic player strategies,* when a player has a lot of power in a market and possesses strict competitive attitude. This strategy differs from leader strategy, because even though his power in a market is big, in case of leader strategy, the player pays attention more to the interests of his individual company (for example seeks to increase profit, market share, sales, develop infrastructure), and as a result the position of competitors becomes worse. Whereas in the case of hegemonic player strategy, the player seeks to eliminate other competitors.
- *Paternalistic player strategy,* when a player, who has a lot of power in a market, is not willing to abuse it, but seeks to co-operate with the competitors.
- *Marginal strategies,* when a player has little power in a market of intensive competition and in order to survive, keeps to strict competitive approach, which means that he wants to eliminate competitors from a market; in other words, the player has reached a certain threshold point, when only the elimination of competitors may help him to survive.
- *Solidary strategies*, when a player has little power in a market and tries to strengthen his position, he is willing to co-operate or make associations with other players.

A game between hegemonic and marginal players is defined as a game between two players in antagonistic positions, where one of them is powerful, and the other is weak and they both are willing to compete against each other. Hegemonic player is strong and is willing to destroy smaller competitors. He may take such measures as threatening, blackmailing, blocking sources of raw materials. He can make pressure to his clients not to buy goods and services from smaller competitors. The only possibility for this player to reach equilibrium point is to optimize so called monocriteria, when a player ignores all functions of goals from his smaller and weaker competitors and simply optimizes the function of his own goals. Any responsive actions can be treated as "random noise" or unforeseen, undesirable case in business.

A player, who acts according to marginal strategy, does everything, what is necessary to survive. Such player is brave and ready to fight. He seeks to gain advantage as much as possible, trying to act in such a way that other players would incur losses, especially that player, who is in hegemonic position. Game equilibrium can be reached by a player, who uses marginal strategy, when he tries to make the main competitor weaker, hegemonic player's function of goals, so that he would incur as much losses as possible. So, in the games between the players, who keep to hegemonic and marginal strategies, is common to take marginal measures towards other players.

In a game between paternalistic strategy and solidary strategy players, the first one, the stronger player, with the help of his decision, models his own actions in a game together with the actions of the weaker competitor, seeking for common business development as a target goal. *According to da Costa et al. (2009), this type of games is similar to the relationship between the parents and children, when the stronger side (parents) demonstrate power towards weaker side (children) and take care about them. They do everything, what is necessary according them, in order to encourage common business growth, welfare, and harmony. Equilibrium can be achieved through the optimization of both players' functions of goals in case of paternalistic strategy, for example, both players' functions of goals can be match in the way of linear combination (Haimes, Li, 1988). However, it is important to remember, that indicating relative weight of each player in a game, the players, who choose paternalistic strategy, must assess the risk, associated with possible decisions of weaker players. For example, weaker players can take priority to autonomous, independent* activity, and not to allow being watched over by a bigger company.

The player, who keeps to solidary position, undertakes the opposite position to paternalistic strategy position. It is a situation in a game, when a player has weak power in a market and is willing to co-operate. Being unable to impose its interests on the other player or to negotiate with it from a balanced position, he seeks to follow the rules set down by the strongest player in an attempt to obtain at least a certain individual advantage. If he does not obtain such advantage, these players may prefer to leave the game. Similarly behave the members of co-operative organizations: they only need to decide whether their membership in an organization is going to bring any benefit, or is it more beneficial to act independently, taking all possible risk. Equilibrium cannot be reached in such a game, treating a problem as it has two solutions: join a group or act independently.

As seen from the descriptions of Game strategies, the players are willing to achieve strategy equilibrium in each strategic game situation. Game *equilibrium strategy* is perceived as the way of problem solving in a game. According to da Costa (2008), it helps to reach a decision, which can be made by the players, pay-

ing attention to the objective functions of each other, and match the conflict of interest to a certain extent. Scientific literature analysis (da Costa, 2008; da Costa et al., 2009; O 'Connor et al., 2014; McCain, 2014) allowed to identify, that the application of one or another equilibrium strategy depends on the following factors:

- Structure of a game;
- Number of players;
- Players' willingness to co-operate or compete;
- Information structure, available for each player;
- Participation or absence of privileged players (who could impose their strategy to other players).

Generic mathematical notations, used to point out separate dynamic game elements, are the following:

P_i, with $i = 1, \ldots, N$ – means ith player;

$k = 0, 1, \ldots, K$ – is the index, which defines each K + 1 stage of the game (for the sake of simplicity, index k will be omitted for dynamic single-stage games);

x_k – is the vector state of the game at the beginning of stage k; the sequence $\{x_0, x_1, \ldots, x_k, \ldots, x_K, x_{K+1}\}$ describes the evolution of the game, given x_0 its initial state;

u^i_k – is the decision vector taken by player P_i in stage k; the sequence $\{u^i_0, u^i_{1, \ldots}, u^i_{k, \ldots} u^i_K\}$ represents all the decisions made by P_i during the game;

$z_i = J_i (x_1, \ldots, x_{K+1;} u^i_{k, \ldots}, u^N_K)$ – is the objective function for player P_i;

$x_{k+1} = f_k (x_k; u^1_{k, \ldots}, u^i_{k, \ldots}, u^N_K)$ – is the transition-equation of the game, from stage k to k + 1;

$u^i_k = \gamma^i_k (\acute{\eta}^i_k)$ – is the control function, where $\gamma^i_k (\ldots)$ is the strategic function of the game and yra $\acute{\eta}^i_k$ – is the set of information available to player P_i in stage k.

Assume, a game is of one stage and two players are present – P_1 and P_2, their decision variables are denoted u^1 and u^2, and strategic functions are denoted $\gamma^1 (\ldots)$ and $\gamma^2 (\ldots)$, respectively. Equilibrium point of this game is decision set (u^1, u^2), when the players think, that they found possible optimum combination for their objective functions, paying attention to the limitations of a game and the players perceived actions of posture and power. Game equilibrium strategy is a combination of functions $(\gamma^1 (\ldots), \gamma^2 (\ldots))$, which leads towards the equilibrium point, meaning closer to a decision, which has to be made by the players, in order to solve their conflict of interests (da Costa et al., 2009).

2.2.2. Game winning matrix

Based on the information in academic journal "Monetary Studies" (2006) from Lithuanian Bank, the essence of a game consists of subjects' strategic interaction, the result of which is never determined unilaterally: one player's actions depend on the actions, made by other players, or the actions, which will be made in the future. So, the position of the players is assessed through the strategic interaction, based on available information from the past and future expectations. Planning and actions of all the players combine a solid game model, and the background of Game theory application is its analysis.

A game winning matrix is combined for the analysis of strategic interaction between participating subjects (players). The simplest way to combine a game winning matrix is to stick to an assumption, that two players participate in a game, and the number of strategies, that the players can choose from, is finite. Decision making in scientific literature (Barberis, Huang, 2008; Baker et al., 2009; He, Zhou, 2011; O'Connor et al., 2014 and other) simultaneous actions games are shown in the form of "normal" and "strategic", involving game table (so called matrix), where the interrelation between the players' strategic choice and payoff of each strategy is demonstrated. The agreement is made, that first table row contains player's payoff, listed as the first, and the first table column contains player's payoff, listed as the second (see Table 7).

Table 7. Relationship between the strategies of the players and their payoff

		Column player (S)	
		Strategy S1	Strategy S2
Row player (E)	Strategy E1	a,b	c,d
	Strategy E2	e,f	g,h

Source: compiled by the authors with the reference to information from university of Santa Barbara (2011).

As seen from Table 7, if a row player (let us call him player E) chooses strategy E2, and a column player (let us call him player S) chooses strategy S1, the payoff of the row player (player E) is e, and the column player (player S) the payoff is f. If the player E chooses strategy E1, and the player S chooses strategy S2 at the same time, then the player's E payoff will be equal to c, and the player's S payoff will be equal to d.

One of the first game winning matrix was composed by Nobel prize winner T. C. Schelling (1960), who has analyzed problems from conflicts of interest between various countries. The author has analyzed a situation, when two countries did not agree upon the right about a specific territory. In this conflict of interest situation, the assumption was that each country can choose one out of two strategies: mobilize armed forces or stay away from it. Having mobilized armed forces, the possibility of military conflict would increase significantly. Since the involvement into a military conflict is the result, which brings negative consequences to the country, it is considered, that the payoff of one and another countries is equal to zero, when performing mobilization (see Table 8).

Table 8. Game matrix example of conflict of interests between two participants

		Country N	
		Military forces mobilization	Staying away from mobilization
Country M	Military forces mobilization	0,0	a,c
	Staying away from mobilization	c,a	b,b

Source: compiled by the authors with the reference to Schelling (1960) and information from Lithuanian Bank academic journal "Monetary Studies" (2006).

The country's, which stay away from mobilization, possibility of war reduces, and each country can expect specific positive result *b*. However, if mobilization would be conducted by only one of the countries, and the other would stay away from it, the payoff would be result *a* for country-aggressor, and the payoff for country, which was invaded, the payoff would be result *c.* It is assumed that a > b > c > 0. So, the war is the worst result of a game for both countries.

In scientific literature (Nicolis et al., 1983; Sahin et al., 2009; Halevy et al., 2011 and other) previously described type of games (when two players participate and can choose from two strategies) are also called "*Chicken"*, "*Hawk-Dove" or "Snow-drift"* games*.* The principle of this type games is that, while it is beneficial for both players, that other player gives up, their optimum choice depends on how the opponent behaves: if the opponent gives up, the first player does not give up, but if the opponent does not give up, then the first player has to give up. The name of "Chicken" strategy originates from the U.S.A. common bet practice between two drivers, when two drivers drive really fast one towards another and have to be brave enough, not to turn on the side. The driver, who first loses courage and turns the car on the side, loses the game, and is treated as "chicken". "Chicken" type game matrix example is shown in Table 9.

Table 9. "Chicken" type game matrix

		Second driver	
		Not to turn	Turn
First driver	Not to turn	-100,-100	1,-1
	Turn	-1,1	0,0

Source: compiled by the others with the reference to the information form website "Game Theory" (2006).

As seen from Table 9, if both drivers chose strategy not to turn the cars, the car accident would be inevitable and both drivers would die (payoff is equal to (-100,-100)). Knowing this, each player believes, that his opponent will be wise, will turn the car on the side on time and give the victory to him. If both drivers turn the cars on the side, their payoff from the game is equal to zero (none of them proves to be "chicken"). So, in this uncertain situation two purely strategic equilibrium exist, when one of the players turn the car on the side and the other doesn't.

"Hawk-dove" game strategy was first introduced by John Maynard Smith and George Price in their work "The logic of animal conflict" (1973). Traditional "Hawk-dove" game matrix is shown in Table 10.

Table 10. "Hawk-dove" type game matrix

	Hawk	**Dove**
Hawk	(V-C)/2, (V-C)/2	V,0
Dove	0,V	V/2,V/2

Source: compiled by the authors with the reference to Fink et al. (1998).

In "Hawk-dove" game the following situation is analyzed, when two subjects compete for common resources and wishing to share those resources, the players can choose between mutual conflict or peace. In this game V means the value of resources, C – the costs of escalated conflict. It is almost always assumed, that the value of resources is lower, than the costs of conflict, meaning, $C > V > 0$. If $C \leq V$, then the game becomes Prisoner's dilemma (see subchapter 2.4.1). "Chicken" and "Hawk-dove" games are identical based on Game theory point of view; only the names are different, paying attention to the origin of game situations.

In business area the equivalents of strategies' military mobility or keeping away from mobilization, could be price increase or keeping away from price increase,

price reduction, or keeping away from price reduction, the goal to push out competitors from the market, or keeping away from this goal. Game winning matrix is composed in order to mathematically express the benefit of each player, which will be received depending on the scenario.

In simultaneous actions game, when a decision is made without knowing, what strategies the opponents will choose, the player must think not only about, what choice is the best for him, but also about possible choice of other players. *For example, students prepare for a test thinking, what questions could be chosen by a lecturer; two business companies separately one from another decide, whether to release a new product on a market. Even though it is hard to forecast in reality, what strategy will be chosen by an opponent, it is assumed after the analysis of simultaneous action games, that each player's choice variants are known to other players (students know the material from which the lecturer is going to prepare a test, competing companies know, that a release of a new product on a market is beneficial due to potential profit increase).*

Analyzing simultaneous action games, a question often rises, what does it mean, when saying, that equilibrium strategy for both players is the best mutual strategy (when two players participate in a game)? Such question is reasonable, paying attention to the fact, that one player cannot see or know for sure, what the other player does and cannot impact his actions (a student cannot see in reality, what questions have been chosen by the lecturer, and cannot impact test questions; business company cannot see, at which stage in new product release its opponent is and cannot impact neither the speed, nor the features of a new product). In named cases, it is taken into consideration, what strategy *can be* taken by a rationally thinking opponent, but not sure if he will definitely choose it. So, simultaneous action games and their consequences are assessed based on probabilities and subjective approach. When the probabilities are formed, rational player has a goal to maximize his expected benefit choosing such a strategy, which in his opinion, would be the best response to expected actions of the opponents (for example, a student can choose a strategy to learn all material and be prepared to any question, chosen by a lecturer in a test or he can subjectively decide, which material is the most important to learn, and as expected, that the lecturer will definitely include it into the test; business company can assume, that its competitor has started preparing a sketch for a new product and will be in a hurry to do the same, or it can decide, that during economic recession competitors will not try to introduce new products on a market due to low demand and will postpone it for future better times.

According to information from University of Santa Barbara (2011), subjective assessments and assumptions on expected opponents' actions are formulated based on the following ways:

- Insights way – on the basis of their knowledge and experience. In this case, the question is: *what would I do if I were my opponents?*
- Historical way – it is assumed, that the opponent will follow the strategy, which had already been used in the past. This method can be applied only in repeated games.
- Imitation (or learning from others) way – the question: what strategies are selected by other entities (*other than my opponents, for example, other students, other businesses) in a similar situation?*
- Communications against playing a game way – when a player, before making a decision, communicates with an opponent or with the experts in the field (for example, the other teachers, business consultants, etc.).
- Signaling way – when a player, before making a decision, is looking for any signs or signals, that the opponent is prepared to take a certain strategy, rather than other strategies (for example, a teacher gave even two lectures on a specific topic for analysis, so it is likely that this topic will be included into a test; company-competitor brought new equipment, so it is likely, that it plans to resume production capacity).

Let us consider the role of subjective assessments and assumptions for decision-making in a coordinated game (see Table 11).

Table 11. Strategies and payoffs of players in a coordinated game

		Column player (S)	
		Strategy X	Strategy Y
Row player (E)	Strategy X	0,0	1,1
	Strategy Y	1,1	0,0

Source: compiled by the authors with the refrence to information from University of Santa Barbara (2011).

Let us say, that according to player E, probability exists p = 0,5, that player S will choose strategy Y. The best response for player E to this strategy is to choose strategy X: then player's E expected payoff having chosen strategy X is equal to 0(1-p)+1(p) = p. Whereas expected payoff having chosen strategy Y is equal to 1(1-p) + 0(p)=1-p. An assumption is made, that p = 0,5, player's E expected payoff having chosen strategy X (meaning payoff p) is bigger, than payoff having chosen strategy Y (meaning payoff 1-p).

2.2.3. Equilibrium of a dominant strategy

Based on the information from website "Policonomics" (2012), the dominant (prevailing) strategy is a certain strategy, which is better than other strategies for a certain player, regardless of what actions other players can take. In other words, the dominant strategy is such strategy, which could bring the biggest payoff for the player (Sonmez, 2013).

Taking into consideration the strength of a strategy, two dominant types of strategies are distinguished in Game theory:

- Strictly dominant strategy;
- Weakly dominant strategy.

Strictly dominant strategy is denoted as a strategy, which always assures bigger benefit for a player, regardless of what strategy other players choose (Einy et al., 2002; Rozenfeld, Tennenholtz, 2007; Wang et al., 2008; Dixit, Skeath, 2015 and other).

Weakly dominant strategy is such a strategy, which assures bigger benefit for one player and more or less equal level of benefit for other players as well (Wang et al., 2008; Sonmez, 2013; McCain, 2014; Dixit, Skeath, 2015 and other).

Strategy, which dominates against another is called *dominated*, or less rational strategy (Dixit, Nalebuff, 2008; Sonmez, 2013; McCain, 2014). If a player can choose from a couple possible strategies, it is assumed, that less rational (dominated) strategies will be rejected, and a dominant strategy will be taken (Einy et al., 2002; Rozenfeld, Tennenholtz, 2007; Wang et al., 2008; Dixit, Nalebuff, 2008; McCain, 2014 and other).

So, if a player has two strategies – A and B, and compares them between each other, in order to identify, which one is better, the following comparing results of the strategies are possible:

1) Strategy B is a dominant strategy against A strategy, meaning, the choice of strategy B always gives the same good or better result, rather than the choice of strategy A. In that case two possibilities are present:
    a. Strategy B is strictly dominant, meaning that the choice of strategy B always gives a better result, than the choice of strategy A, regardless of what strategy has been chosen by other players;
    b. Strategy B is weakly dominant, meaning that at least one opponents' strategic action exists, against which strategy B is superior

to strategy A, and regarding other opponents' actions, strategy B would give the same payoff, as strategy A.

2) Strategies B and A are equivalent: strategy B is not dominant against strategy A and vice versa. The choice of strategy A is better in some cases, depending on the actions of the opponents.

3) Strategy B is less rational against strategy A, meaning that the choice of strategy B will never give better results, than the choice of strategy A, regardless of what actions the other players would take. In that case two possibilities also exist:

    a. Strategy B is weakly dominated by strategy A, meaning that at least one opponents' strategic action exists, against which strategy B gives worse results, than strategy A, and regarding other opponents', strategy A would give the same payoff, as strategy B (in other words, strategy A weakly dominates against strategy B);

    b. Strategy B is strongly dominated by strategy A, meaning that the choice of strategy B always gives worse results, than the choice of strategy A, regardless of what actions of other players would be (in other words, strategy A strictly dominates against strategy B).

Based on previously described strategy comparing results, the conclusion could be the following:

- Strategy B could be treated as strictly dominant, if it is strictly dominant against any other strategy;
- Strategy B could be treated as weakly dominant, if it is dominant against all other strategies, however, against some of the strategies it is weakly dominated;
- Strategy B could be treated as strictly dominated, if any other strategy exists, which is strictly dominant against strategy B;
- Strategy B could be treated as weakly dominated, if any other strategy exists, which is weakly dominant against strategy B (Sonmez, 2013).

If each of the players, who participate in a game, have a dominant strategy, it is logical to think, that they will choose this strategy. In this way, the equilibrium of a dominant strategy is received. (Sonmez, 2013; McCain, 2014).

The equilibrium of a dominant strategy is received, when each player chooses his dominant strategy (for example in the case of Prisoner's dilemma, described in

subchapter 2.4.1, both players' dominant strategy is to confess, and that means, that a confession from one side of the player, and the confession from other side of the player results in the equilibrium of a dominant strategy), even though this equilibrium does not fit into the optimum conditions of Pareto. It is noted, that the equilibrium of any dominant strategy is Nash equilibrium. However, not all Nash equilibriums are the equilibriums of the dominant strategies.

Due to the fact, that one player can usually choose from more than one strategy, and two or more participants are present in a game, the structure of a game becomes complex, and from mathematical point of view, it is difficult to solve such a complex task with many unknown variables (without knowing, which strategy will be chosen by one or another player). In order to simplify the analysis of any game, the elimination method of less rational strategies is used. To eliminate less rational strategy means to eliminate each player's strategy, which seems to be irrational (Dixit, Nalebuff, 2008; Sonmez, 2013; Dixit, Skeath, 2015 and other). This elimination process for less rational strategies is called *Iterated elimination of dominated strategies* (Sonmez, 2013; McCain, 2014). The first step applying the elimination method for less rational strategies is the elimination of the least rational strategies for each of the players from a game matrix (it is assumed, that each player is rational, and he perceives, using general knowledge, what is rational for him and for other players, therefore he will not choose the least rational strategies). This way, elimination of the least rational strategies from a game matrix allows to reduce significantly the number of expected strategies and equilibriums of a strategic game. In other words, the volume of a game is reduced. The strategies, which were not dominant until the elimination, can become dominant, when the volume of a game reduces. Then the first step is repeated, meaning that from a smaller game volume again the least rational strategies for each player are eliminated. This way the volume of a game keeps reducing. The process of elimination ends, when no player has the least rational strategies.

In scientific literature (Rapoport, Amaldoss, 2000; Hofbauer, Sandholm, 2011; McCain, 2014; Dixit, Skeath, 2015 and other) two elimination versions of the least rational strategies are distinguished:

- Elimination of strongly dominated strategies only.
- Elimination of strongly and weakly dominated strategies.

In the first case, having eliminated only strongly dominated strategies from game matrix, only one strategy remains for each player. This strategy is treated as Nash strategic equilibrium (more detailed description about Nash strategic equilibrium is placed in 2.2.4 subchapter). In the second case, when from a game matrix are eliminated strongly and weakly dominated strategies, at the end of the process,

only one strategy remains for each player as well, and it is also treated as Nash strategic equilibrium. However, on the contrary to the first case, when weakly dominated strategies are eliminated, it is possible to eliminate and some Nash equilibrium at the same time. Due to this reason, Nash equilibrium, received after the elimination of weakly dominated strategies, can be *more than one* in a specific game. Possible cases, when eliminating weakly dominated strategies in different order, different Nash equilibriums are received. Therefore, even though the elimination method of dominated strategies (less rational) is easy to use, when only strongly dominated strategies are present in a game, the elimination of weakly dominant strategies can be problematic, and the final game can differ a lot form a regular game through the strategic point of view.

In the article from "Policonomics" (2012), the example of less rational elimination of strategies is provided – the analysis of battle of the Bismarck Sea, held on 2nd – 4th of March, in 1943, between Japan and the U.S.A. The battle was treated as a strategic game, which was conducted between two players, therefore, a game matrix was formulated from the first place (see Figure 6).

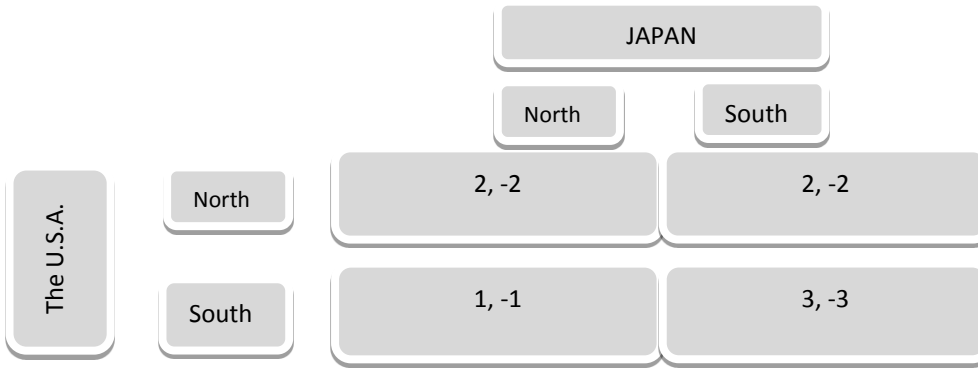

Figure 6. Strategic game matrix of the Bismarck Sea battle between Japan and the U.S.A

Source: "Policonomics", 2012.

Game matrix in Figure 6 shows, that the U.S.A has no dominant strategy in this game, because the payoff sum of their first strategy is equal to the payoff sum of their second strategy. However, the strategy of Japan to go to North is weakly dominant. Due to the fact that only one participant out of two has a dominant strategy, this game has no equilibrium of dominant strategy. Then the strategies, which are treated as less rational players' strategies, should be eliminated. Since the only dominant strategy in this game is the strategy of Japan to go to North,

which is a dominant strategy against the strategy to go to South, the latter is treated as less rational and is eliminated. It is assumed, that Japanese will go to North. Keeping to this assumption, the strategy of the U.S.A. to go to North becomes strictly dominant against the strategy to go to South, therefore the latter is treated as less rational and is eliminated. In this way, the equilibrium of dominant strategies is received – to go to North for both players.

The examples of dominant strategies equilibrium in business could be the game analysis of two big automobile manufacturing companies "Ford" and "General Motors", made by Institute Santa Fe (2016) (see Figure 7).

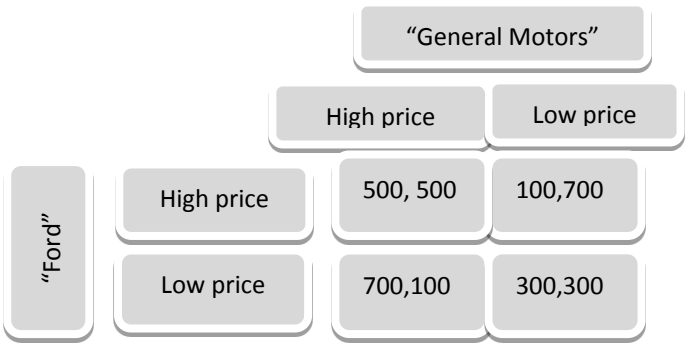

Figure 7. Example of a pricing game between "Ford" and "General Motors"

Source: Santa Fe Institute (2016).

Let us say, that the quality of the cars, produced by both companies is very similar, therefore the price is such factor, that the customer pays attention to before deciding, which company to buy the car from. If both companies agreed to set high prices, each of them could earn around 500 million dollars of profit. If one of the companies decided to set high prices for the cars, then another company could get benefit from breaching the contract and selling the cars for lower prices. Having set lower prices, the company would actually overtake the whole market and earn about 700 million dollars of profit, whereas its competitor would earn only 100 million dollars (equilibrium of the dominant strategy). If both companies set low prices, they could equally share enlarged market, and would earn 300 million dollars of profit each.

If more than two players are participating in a game, their dominant strategies are set in the same principle, as in previously described example. A game matrix example, when three players are participating, is shown in Figure 8.

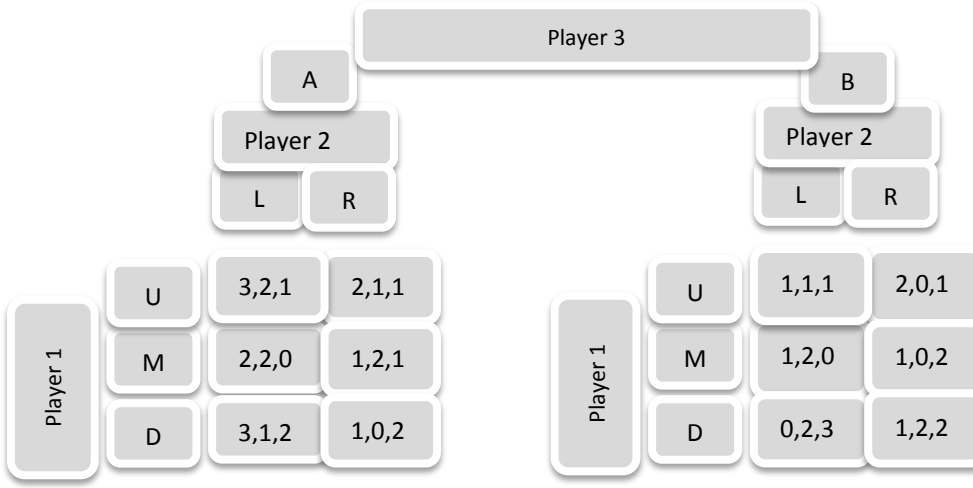

Figure 8. Example of a game matrix in the presence of three players

Source: Sonmez, 2013.

As seen from Figure 8, the dominant strategy of the first player is U, the dominant strategy of the second player is L, and the dominant strategy of the third player is B. So, the strategy (U; L; B) is the equilibrium of this game dominant strategy, the payoff of which is (1, 1, 2).

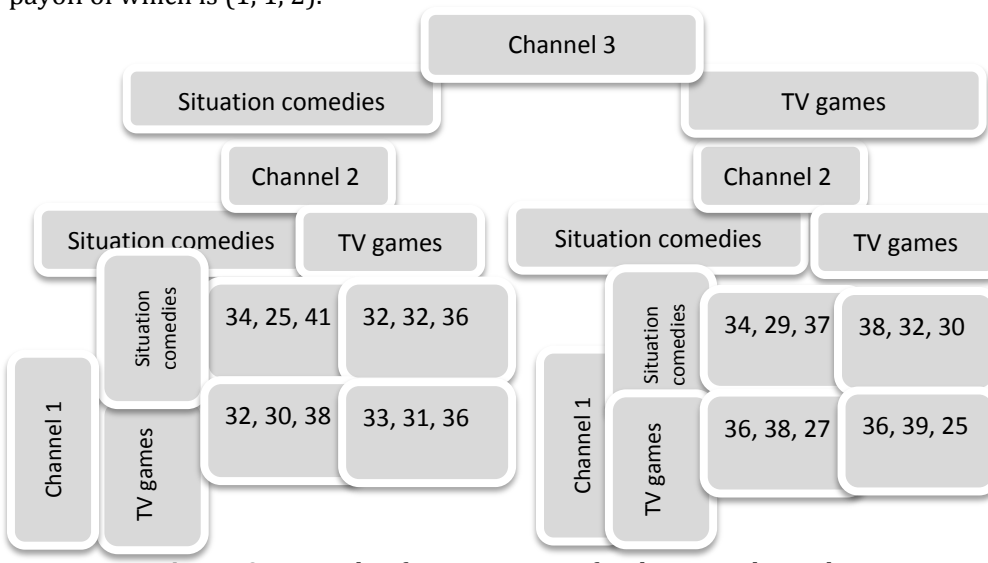

Figure 9. Example of a game matrix for three TV channels

Source: University of Santa Barbara, 2011.

University of Santa Barbara (2011) provides the example, where three TV channels compete in the market. The percentage parts of audience, which the channel attracts showing one or another TV program, are expressed in figure 9. The sum of all possible game strategies is equal to 100 % n each case (meaning that totally a 100 % audience can be attracted) (see Figure 9).

As seen from figure 9, pure strategy of Nash equilibrium in this game for Channel 1 is to show TV games, for Channel 2 also to show TV games, and for Channel 3 is to show situation comedies (strategy, the payoff of which for each player is 33, 31 and 36 % of audience, accordingly).

If the players have different number of strategies (for example, one player has four strategies, another has two), game matrix could be formulated as the following (see Figure 10):

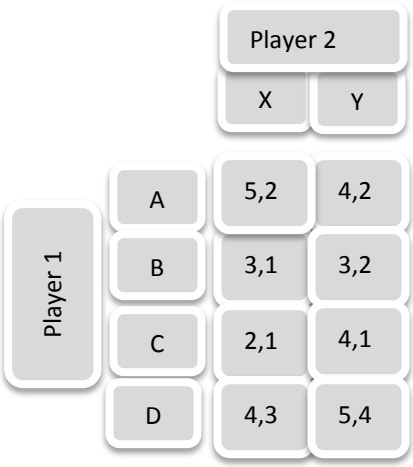

Figure 10. Example of a game matrix for the players, who have different number of strategies

Source: Sonmez, 2013.

As seen from Figure 10, the first player has no clear dominant strategy, which would be dominant against other strategies, however strategies B and C are less rational for him. Dominant strategy for the second player is strategy Y, and strategy X is less rational. Therefore, the first player makes an assumption, that the second player will not choose strategy X, and the second player makes an assumption, that the first player will not choose strategies B and C. Therefore, having eliminated less rational strategies, the game matrix becomes smaller (see Figure 11):

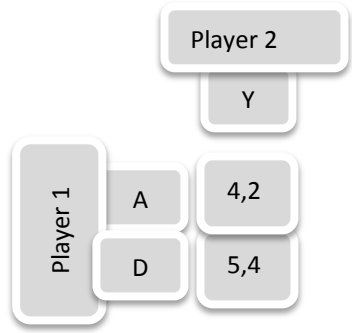

Figure 11. Game matrix after the elimination of less rational strategies

Source: Sonmez, 2013.

In this smaller game matrix, the dominant strategy of the first player is D (meaning, that strategy D is a dominant strategy against strategy A). Only strategy Y is left for the second player. Therefore, it is assumed, that the players will choose strategy (D; Y) in this game, the payoff of which is (5, 4).

> ***Summary*** *– the equilibrium of a dominant strategy is reached, when each of the players chooses his dominant strategy rationally, even when after choosing it the received equilibrium does not fit into optimum conditions of Pareto*[1]*. According to McCain (2014), equilibrium of a dominant strategy is not often possible in a situation, when the optimum choice of one player depends on what optimum choice of other player he will foresee, a dominant strategy is absent. If a game is complex and each player can choose between couple of strategies, to make the analysis of a game easier, the elimination method of less rational strategies helps, which allows to eliminate each player's possible strategy, which seems to be irrational, and so to reduce the number of expected strategies and strategic game equilibrium significantly. However, dominated (the least rational) method of strategy elimination is effective, when only strictly dominated strategies exist in a game. Whereas, eliminating weakly dominated strategies, the final game matrix can differ significantly from a regular game through the strategic point of view.*

[1] Italian engineer Vilfredo Pareto (1848–1923) has created the theory of possibilities, how to increase economic welfare. Pareto has named the conditions, based on which one's welfare can be increased without decreasing the welfare of others. When such effectiveness of resources is reached, so called Pareto optimum, any other re-distribution of resources will determine the deterioration of someone's position. (Vainienė, Dictionary of economic terms, 2015b).

2.2.4. Nash equilibrium

Nash equilibrium is very well depicted in the movie "Beautiful mind" in 2001. Life drama, based on real facts of mathematical genius John Forbes Nash Junior, who's painful journey of self-discovery is separated by one step from big glory and mental illness. John, who was born in a poor family, wishes the only thing, to find something, what has never been found earlier. It is recommended to spare couple of minutes to watch the film trailer, from 19th minute until 21st minutes and 40 seconds, for the readers of this monograph, where the main character reveals the concept of Nash equilibrium within named timeframe. After the entrance of five girls to a bar, one out of which is especially pretty, the best strategy for the boys, sitting at the bar, would be to ask that pretty girl's friends for a dance, and not try talking to the pretty girl one by one. So, if a co-operation agreement is made in advance, all the players of a game will win (girls and boys) and the best variant of winning for each of the participating players in the game, will be achieved. Of course, one condition must exist, that all participating parties in the agreement will not betray each other and will not change the sequence of a game.

It is a pity, that only after the fight with the illness, which lasted for decades, in 1994, the mathematical discoveries of John Forbes Nash have been awarded with Nobel Prize.

In previous subchapter, we have indicated, that dominant strategies and equilibrium of dominant strategies are not characteristic in some games. When an equilibrium of a dominant strategy is characteristic in a game, it becomes a powerful tool for the analysis of non-co-operative type strategic game. However, we have also identified, that some games do not have an equilibrium of dominant strategy, and the players may not wish to change the defined strategy to another from one side just in order to achieve the equilibrium of a dominant strategy. In this case, in order to analyze such type of games successfully (without dominant equilibrium) other conception of equilibrium is necessary. Then the analysis of Nash equilibrium helps.

Nash equilibrium is a term, which is used in Game theory to denote equilibrium situation, where each player's strategy is optimum, when specific strategies of other players are present. (Porter et al., 2008; Conitzer, Sandholm, 2008; Dixit, Skeath, 2015 and other). Nash equilibrium is achieved, when none of the players deviate from the chosen strategy, because this is not beneficial (or profitable) for them. In other words, none of the players will take different actions, until other players keep to their chosen strategies. Of course, none of the players know for sure, what strategies will be kept by the opponents. The assumption is made only, that the opponents, thinking rationally, should choose one or another strategy.

Therefore, Nash equilibrium can be also interpreted as such possible combination of strategies, which is the most appropriate for each of the players, and they do not wish to change them. Nash equilibrium is a variant of Cournot equilibrium, which is formed, when each company, participating in a game, maximizes its profit, knowing, that the opponent is doing the same. According to McCain (2014), Nash equilibrium is achieved naturally: when the players occur at the point of Nash equilibrium, they wish to change nothing, because the change would make their situation worse (see Figure 12).

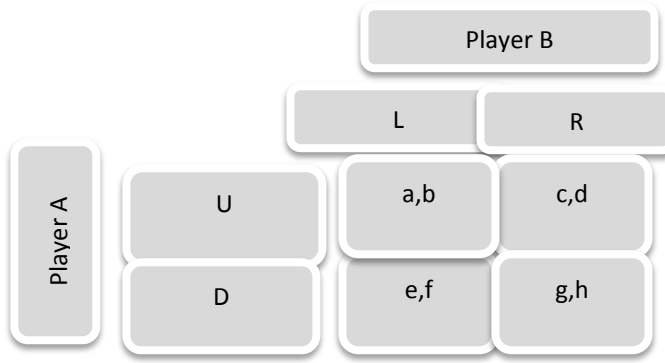

Figure 12. Example of Nash Equilibrium in a game

Source: Sonmez, 2013.

As shown in Figure 12, if the player A deviates from strategy U to strategy D, then his payoff will reduce from 5 to 4. If the player B deviates from strategy R to strategy L, his payoff will reduce from 5 to 1. Therefore strategy (U; L) is the strategy of Nash equilibrium, which conditions payoff for both players (5; 5). Having written in general form the situation of a game, we receive the following (see Figure13):

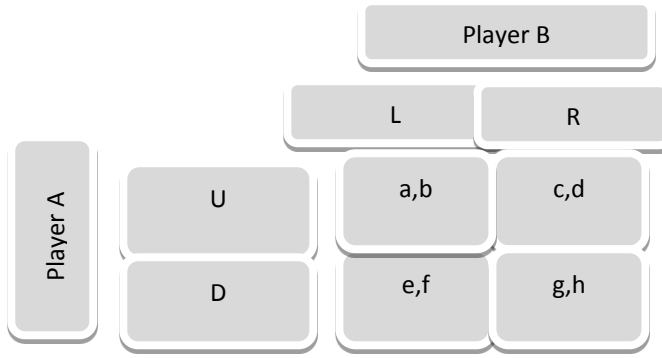

Figure 13. Common situation of Nash Equilibrium in a game

Source: compiled by the authors with the reference to Sonmez (2013).

So, in order to achieve Nash equilibrium, payoff *a* should be bigger than payoff *e*, payoff *c* should be bigger than payoff *g*, payoff *b* should be bigger than payoff *d*, and payoff *f* should be bigger than payoff *h*. In other words, so that strategy (U; L) becomes Nash equilibrium strategy, *a* should be bigger or equal to *e*, and *b* should be bigger or equal to *d*. These are mandatory conditions for Nash equilibrium. Knowing other player's choice, each player chooses an optimum strategy for himself.

Sonmez (2013) has analyzed the situation, when three players are present in a simultaneous action game (see Figure 14).

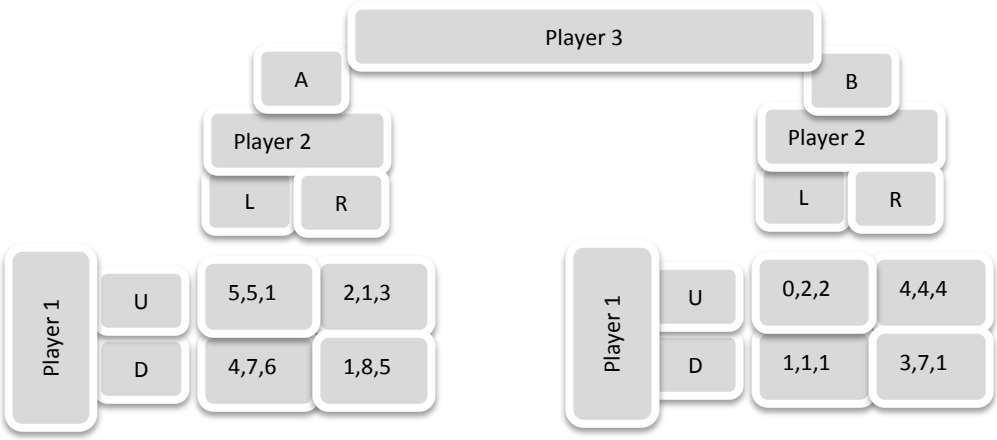

Figure 14. Nash Equilibrium in a game with three players

Source: compiled by the authors with the reference to Sonmez, 2013.

The player 1 chooses between the strategies, portrayed between the rows U and D, the player 2 chooses between the strategies portrayed between the columns L and R, the player 3 chooses between matrixes A and B. Strategies (U; R; B) is the only Nash equilibrium in this game.

McCain (2014) has researched a very interesting example of Nash equilibrium, where two radio stations have been choosing to broadcast programs of various forms. Each radio station can choose from three types of program formats in this example: to broadcast the most popular songs Top 40, to choose classic rock programs or mixed programs. So, two players are present in the game and they can choose one out of three strategies (see Table 12).

Table 12. Game matrix between two radio stations for the format of broadcasting show

		Radio station "KH"		
		Top 40	Classic rock	Mixed programs
Radio station "Double FM"	Top 40	30,40	50,45	45,60
	Classic rock	30,60	35,35	25,65
	Mixed programs	40,50	60,35	40,45

Source: McCain, 2014, p. 68.

Since two radio stations, who participate in a game, have different reputation among the listeners, hire different radio hosts and DJs, their payoff is not symmetric: it is proportional to net income of radio stations, received from advertising. In the cells of Table 12, the first number denotes the payoff of radio station "Double FM", and the second number denotes the payoff of radio station "KH". The best responsive strategies of every participating radio station to competing strategy of radio station are shown in Table 13.

Table 13. The best responsive strategies of radio stations

Responsive strategies of radio station "Double FM"		**Responsive strategies of radio station "KH"**	
Strategy of radio station "KH"	The best responsive strategy of radio station "Double FM"	Strategy of radio station "Double FM"	The best responsive strategy of radio station "KH"
Top 40	Mixed programs	Top 40	Classic rock
Classic rock	Mixed programs	Classic rock	Mixed programs
Mixed programs	Top 40	Mixed programs	Top 40

Source: compiled by the authors with the reference to McCain, 2014, p. 68.

From Tables 12 and 13 we can see, that it could be more beneficial to choose various responsive strategies for the radio stations in each case, depending on what the competitor will choose. None of the radio stations have a dominant strategy. Let us say, that the radio station "Double FM" chooses mixed program strategy, and the radio station "KH", chooses Top 40 strategy. In this case, each radio station chooses the best possible responsive strategy to the competitor's actions. If,

for example, both radio stations chose mixed programs, then for each of them would be more beneficial to start broadcasting Top 40. It means, that both players would get bigger benefit through the modification of their initial strategy. That is why the situation, when the radio station "Double FM" chooses a mixed program strategy, and the radio station "KH" chooses Top 40 as a response, is Nash equilibrium in the analyzed game, because none of the players can change the initial strategy to more beneficial one. Even though this strategy of Nash equilibrium is not the equilibrium of a dominant strategy, however, it is a logical and rational result of non-co-operative game between the radio stations.

It can be difficult to find Nash equilibrium in games, when the number of the strategies increases, that the players can choose from. In such cases, it is based on so called heuristic methods, including visualization, (heuristic methods are such problem-solving methods, which are fast and reliable methods, however they are informal and possibly cannot act in an unusual circumstance (McCain, 2014)). Based on these methods, the strategies, which do not combine an equilibrium are eliminated, and the equilibrium is found in such way (if it exists). The most simple way is to underline the payoff of each case in a responsive strategy. Underlined the best payoff in each case of a responsive strategy, with two competing radio stations, are shown in Table 14.

Table 14. Identification of the best responsive strategies between two radio stations through heuristic method

		Radio station "KH"		
		Top 40	Classic rock	Mixed programs
Radio station "Double FM"	Top 40	30,40	50,<u>45</u>	<u>45</u>,60
	Classic rock	30,60	35,35	25,<u>65</u>
	Mixed programs	<u>40</u>,<u>50</u>	<u>60</u>,35	40,45

Source: McCain, 2014, p. 70.

As seen from Table 14, the underlines show, that the best responsive strategies of both participating radio stations to the actions of one another overlap in the lower left cell, meaning that when the radio station "Double FM" chooses mixed program strategy, and the radio station "KH" chooses Top 40 strategy, as a response. In this way, the application of heuristic method allowed to get the same results as the regular analysis of a game matrix.

As seen from the described examples, the idea of Nash equilibrium is based on strict logics. However, applying this method to a wide situation spectrum of a game, certain problems are faced. First of all, a specific game can have more than one Nash equilibrium. For example, if a game is "Chicken" or "Hawk-Dove" type (see Table 9 and 10), three Nash equilibrium are specific to it. Let us say, that in the case of conflict of interest for the theory between two countries (see Table 8), two pure and one mixed Nash equilibrium are possible. Pure equilibrium is received, when only one country mobilizes military forces. If one country expects, that the other country will conduct mobilization, then the optimum strategy is the second pure Nash equilibrium, which would be to retrain from mobilization. Mixed equilibrium in this situation would mean a random mobilization of each country, and a possibility of war (information from Lithuanian Bank academic journal "Monetary Studies", 2006).

The second problem is that pure Nash equilibrium is achieved, when the participating players try to combine their actions. According to McCain (2014), such negotiation situations are possible in real life, but modeling such situations only in theory, it is very difficult to assess their high or low probability, because the players not only think rationally, but also give up to the impact of various psychological and environmental pressure. That is why, as Schelling (1960) has noted long time ago, the results of experimental psychology would contribute a lot in the analysis of Game theory situations. What is more, acceptable principles of combined actions for both players are found rarely. In this way, mixed game equilibrium is expected, when one player is not sure about the actions of another player. The ways, how to find Nash equilibrium in the cases of complicated games, author Sonmez (2013) has analyzed (see Table 15).

Table 15. Presence of Nash equilibrium in a complicated game

		Player 2				
		V	W	X	Y	Z
Player 1	A	4,-1	4,2	-3,1	-1,2	2,0
	B	-1,1	2,2	2,3	-1,0	2,5
	C	2,3	-1,-1	0,4	4,-1	0,2
	D	1,3	4,4	-1,4	1,1	-1,2
	E	0,0	1,4	-3,1	-2,3	-1,-1

Source: compiled by the authors with the reference to Sonmez, 2013.

If any Nash equilibrium is present in the column V of Table 15, it should be achieved in a cell (A; V). Otherwise, the player 1 will deviate from his initial strategy. However, it is not real Nash equilibrium actually, because the player 2 deviates from his initial strategy. If any Nash equilibrium is present in column W, it should be achieved in a cell (A;W) or in a cell (D;W). Otherwise, the player 1 will deviate from his initial strategy. Since the player 2 does not deviate from his initial strategy in none of the cells (A;W) or (D;W), both these strategic profiles are Nash equilibriums. If any Nash equilibrium is present in column X, it should be achieved in a cell (B; X). Otherwise, the player 1 will deviate from his initial strategy. However, this is not the real Nash equilibrium, because the player 2 changes his initial strategy. If any Nash equilibrium is present in column Y, it should be achieved in a cell (C;Y). Otherwise, the player 1 will deviate from his initial strategy. However, this is not the real Nash equilibrium, because the player 2 changes his initial strategy. If any Nash equilibrium is present in column Z, it should be achieved in a cell (B;Z). Otherwise, the player 1 will deviate from his initial strategy. This is the real Nash equilibrium, since the player 2 does not change his initial strategy.

The third problem of Nash equilibrium is that there are games, which do not have Nash equilibrium at all. *Let us analyze the example, when two business companies – one has a strong position in the market, and another is a new market participant, they both have to choose design for their product. Each of the companies can choose two possible variants of a product design – variant X and variant Y. The company, who has a strong position in a market wishes, that the product of a new company, would seem to be different to their product (so that the consumers would be able to identify easily, which product belongs to which company and would not buy the product from a new market participant). Whereas, the new company wishes, that its product would be similar to the product of the old company (so that the consumers would tend to identify the goods of both companies as similar ones). This situation is modeled based on a game matrix form* (see Table 16).

Table 16. Game example of two companies, when Nash equilibrium is not present

		New company in a market	
		Product design X	Product design Y
Company, well established in a market	Product design X	2,1	1,2
	Product design Y	1,2	2,1

Source: compiled by the authors with the reference to the information from University of Toronto, 2007.

As seen from Table 16, in the cell (X,X) a new company in a market can increase its payoff from 1 to 2 by choosing the product design Y, rather than X. So, this cell is not Nash equilibrium. In the cell (X,Y) company, well established in a market, can increase its payoff from 1 to 2 choosing product design Y, rather than X. So, this cell is not Nash equilibrium. In the cell (Y,X) company, well established in a market, can increase its payoff from 1 to 2 choosing product design X, rather than Y. So, this cell is not Nash equilibrium. And finally, in the cell (Y,Y) a new company in a market can increase its payoff from 1 to 2 choosing product design X, rather than Y. So, this cell is not Nash equilibrium. Since equilibrium is not achieved in any of the cells, because one of the participating companies can increase its payoff in any of the cells, it is assumed, that Nash equilibrium is not present in this game.

Due to previously named reasons (a game can have more than one Nash equilibrium, real environment situations can differ from the models, created in theoretical level, and the achievement of Nash equilibrium can become complicated, due to the reason, that Nash equilibrium may not be present in a specific game), it is often reasonable to recalculate Nash equilibriums (Conitzer, Sandholm, 2008; Sonmez, 2013, McCain, 2014 and other). Let us analyze the example of oligopoly market, when two business companies (let us call them company 1 and company 2) are the only competitors in their activity market. Price in the market is set according to inverse demand equation:

$$P = 10 - (Q_1 + Q_2) \quad (1)$$

Where:

P – market price of goods (services)

Q_1 – production capacity of company 1

Q_2 – production capacity of company 2

General cost function of company 1 is written the following:

$$C_1 = 4Q_1 \quad (2)$$

General cost function of company 2 is written the following:

$$C_2 = 2Q_2 \quad (3)$$

Each company wants to maximize its profit, and both companies choose production capacities at the same time. The question arises: what Nash equilibrium would be in this market? Company 1 wants to maximize its profit. Therefore:

$$\pi_1 = PQ_1 - C_1 = [10 - (Q_1 + Q_2)]Q_1 - 4Q_1 = 10Q_1 - Q_1^2 - Q_1Q_2 - 4Q_1 = 6Q_1 - Q_1^2 - Q_1Q_2 \quad (4)$$

Derivative Π_1 equating to zero, we get:

$$6 - 2Q_1 - Q_2 = 0 \quad (5)$$

Therefore:

$$Q_1 = \frac{6 - Q_2}{2} \quad (6)$$

This is the best responsive strategy of company 1 to the strategy of company 2. It shows, how much (what amount of goods and services) the company 1 should produce, depending on the production volume of company 2.

Similarly, the company 2 also wants to maximize its profit:

$$\pi_2 = PQ_2 - C_2 = [10 - (Q_1 + Q_2)]Q_2 - 2Q_2 = 8Q_2 - Q_2^2 - Q_1Q_2 \quad (7)$$

Derivative Π_2 equating to zero, we get:

$$8 - 2Q_2 - Q_1 = 0 \quad (8)$$

Therefore:

$$Q_1 = \frac{8 - Q_1}{2} \quad (9)$$

This is the best responsive strategy of company 2 to the strategy of company 1. It shows, how much (what amount of goods and services) the company 2 should produce, depending on the production volume of company 1. Now we have the equations with two unknown variables (Q_1 and Q_2), and can solve these equations together:

$$Q_1 = \frac{6 - Q_2}{2} = 3 - \frac{8 - Q_1}{2} = 1 + \frac{Q_1}{4} \Rightarrow Q_1 = \frac{4}{3} \quad (10)$$

Also:

$$Q_2 = \frac{8 - \frac{4}{3}}{2} = \frac{10}{3} \quad (11)$$

Since (Q1, Q2) = (4/3, 10/3) exist in both responsive functions, none of the companies want to deviate from their strategies at this point (does not want to produce different amount of goods). So, Nash equilibrium is received in this way. Nash equilibrium was recalculated based on the best responsive strategy method

in this case. However, other equilibrium analysis methods are possible – Pareto optimum, Stackelberg equilibrium or Minimax equilibrium.

Classic type game equilibrium structure between business companies, received based on strategic game matrix model (see subchapter 2.2.1) is shown in Figure 15.

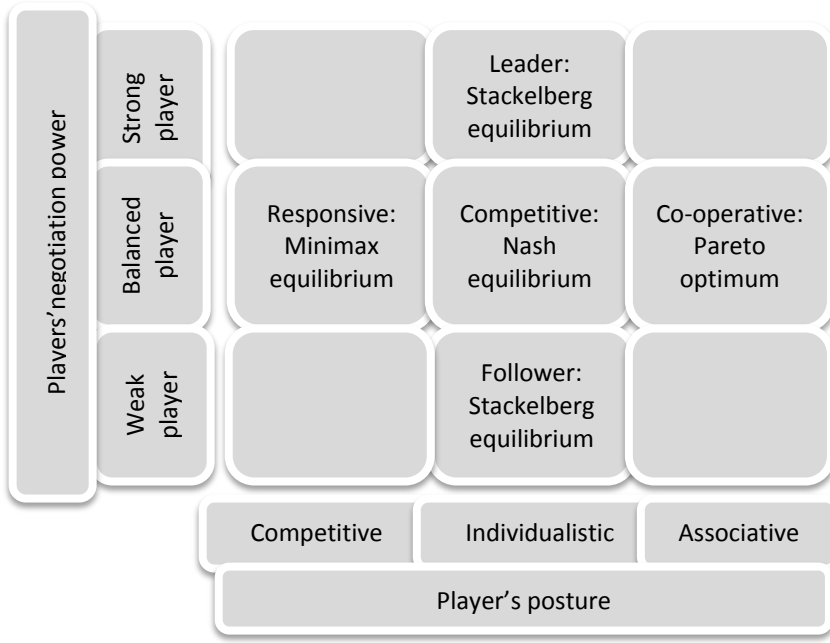

Figure 15. Games of classic type between the equilibrium of business companies' structure

Source: da Costa et al., 2009, p. 144.

As seen from Figure 15, in competitive games (middle matrix cell) a player's strategic position reflects his point of view, power, and actions in a perfect competition market, where many suppliers and buyers of goods and services are present, and one player cannot dominate against others. In non-co-operative variable sum games, the players decide to take competitive strategic position, when they seek to optimize their function of goals and ignore actions, which other players are taking or planning to take (Nash, 1950; da Costa et al., 2009). When such situation is present, neither player can improve the results of a game through the individual change of his decision. The point of Nash equilibrium is achievable, when all the

players make a decision set. In non-co-operative variable sum games, where N players participate, and the game takes place in one stage, the point of Nash equilibrium is written the following:

$$\hat{u}^* = \left(\hat{u}^1, \ldots, \hat{u}^i, \ldots, \hat{u}^N\right) \in \quad U$$

If each $u^i \quad \in \quad U^i$

If i ∈ N, the requirements are conducted at the same time for these N inequalities, which show the values of players' objective functions:

$$J_1(x; \hat{u}^1, \ldots, \hat{u}^i, \ldots, \hat{u}^N) \leq J_1(x; u^1, \ldots, \hat{u}^i, \ldots, \hat{u}^N)$$
$$J_1(x; \hat{u}^1, \ldots, \hat{u}^i, \ldots, \hat{u}^N) \leq J_1(x; \hat{u}^1, \ldots, u^i, \ldots, \hat{u}^N)$$
$$J_1(x; \hat{u}^1, \ldots, \hat{u}^i, \ldots, \hat{u}^N) \leq J_1(x; \hat{u}^1, \ldots, \hat{u}^i, \ldots, u^N)$$

The games, where competitive player's positions are individualistic and the power level is balanced, Nash equilibrium can be explained.

In co-operative games (variable sum games), co-operation between the players can produce better results for all the players, rather than those, which can be achieved, if each player tried to optimize his goals' functions separately, without having any news about other players' actions in advance and without coordinating actions between themselves. When the players decide to share information about the conditions and limitations of a game, possible alternative actions, and goal functions, they have possibilities to achieve the point, called Pareto optimum point (McCain, 2014; Dixit, Skeath, 2015). The best possible decision for all participating players is achieved in this point. If Pareto optimum point exists in a specific game, it is denoted by the fact, that none of the participating players can improve their results, without making other players' results worse. That is why such type of games are also called "win and win" games (as an opposition to "win and lose" games), reflecting, that all participating sides win. However, it is necessary to pay attention to, that a clear or implied agreement between the players must be present in co-operative games, that none of the players can keep to individual interests only, damaging interests of other players. Due to this reason, good will and loyalty atmosphere should be guaranteed in co-operative games. In variable sum, co-operative games, where N players participate, and the game takes place in one stage, if no other point is present, then:

$$u = \left(u^1, \ldots, u^i, \ldots, u^N\right) \in U, so\ that\ J_i\left(u^i\right) \leq \bar{J}_i\left(\hat{u}^i\right), \forall_i \in N$$

Pareto optimum point is written the following:

$$\hat{u}^{*}=(\hat{u}^{1},\dots,\hat{u}^{i},\dots,\hat{u}^{N})\in U$$

This condition requires, that:

$$J_i(u^i)\leq \bar{J}_i(\hat{u}^i),\forall_i\in N$$

So, the games, where competitive players' positions are associative (communicative type) and power level is balanced, Pareto optimum strategy can be explained.

Responsive type games are "win and lose" or "win and win" type games. In these games, every player makes an assumption directly or indirectly, that received benefit from one of the players automatically impacts losses for the other players. Responsive type games are analyzed through zero-sum game analysis principles (see more in 2.3. subchapter). Zero-sum game is denoted as a game, where:

$$\sum_{i\in N}(Z_i)=\sum_{i\in N}(J_i(x_1,\dots x_{K+1},u_1^1,\dots,u_{k1}^i,\dots,u_K^N))\equiv 0$$

As authors da Costa et al. (2009) stated, that in the latter equation any other constant can be entered instead of zero. "S*addle point"*, or support point in this game is zero-sum game solution (if it exists). Every player behaves in such a way, as he thinks is the most favorable, every player seeks to optimize the function of his goals, paying attention to all possibilities he can use. It has to be noted, that the support point has a particular trait – any deviation from this point makes the player's situation worse. Applying Game theory concepts, when two participants are present in a game (N = 2), the support point is denoted as a couple of solutions $(\hat{u}^1,\hat{u}^2)$, which satisfies these inequalities:

$$J_1(\hat{u}^1,u^2)\leq J_1(\hat{u}^1,\hat{u}^2)\leq J_1(u^1,\hat{u}^2) \text{ for each } u^1\in U^1 \text{ ir } u^2\in U^2.$$

Above described strategy is called Minimax strategy. It is noted, that the calculations of support point for the player P_i depends exclusively from other players' goal function. It is so, because the player P_i in this strategy does not pay attention to other players' goals functions (or other players' interests, without trusting their good will, loyalty, or rationality). In other words, this strategy is applied in real situations, where player P_i believes, that other players can be unstable, irrational, unpredictable, and malicious behavior can be expected from them. In responsive type games, the opponents can take intentional actions to harm the player's P_i interests, even though it might be harmful for himself. The games, where the players' positions are competitive, and the power level is balanced, can be explained through Minimax equilibrium strategy.

Leader/follower type of games are not balanced games, where one player (follower) has lower power (da Costa et al., 2009). Both players keep to individualistic

game position. These types of games are explained through equilibrium of Stackelberg strategy. Let us assume, that the market power of the player M and player P is not balanced. The player M is treated as market leader, and the player P is the follower. These players' strategic decisions are market λ and μ, accordingly, and the functions of goals are market R(λ,μ) and J(λ,μ), accordingly. Let us say, that the player M makes his strategic decision due to game structure and rules, and later, when the player P finds out about the player's M decision, makes his decision. If the couple of decisions exists $(\hat{\lambda}, \hat{u}) \in (L, U)$, it denotes Stackelberg equilibrium point.

Summary *– it is noted, that in order to achieve Stackelberg equilibrium point, the follower must be rational, while making his decisions. A couple of Stackelberg strategies could be set for this structure of a game: one for the leader and another for the follower. These types of games are usually applied in conflict of interests' situations, where one player is very strong and another player is very weak; both players keep to an individual competitive position. Therefore, a game, where the players of no balanced power keep to an individual competitive position, and one of them undertakes the leader's position and another takes the follower's role, is explained though Stackelberg equilibrium strategy.*

2.2.5. Irrational (intransitive) decisions in practice

Many economists (da Costa et al., 2009; Jadlovska, Hrubina, 2011; Myerson, 2013; and other) support the point of view, that if rational people have to make a specific choice, for example, to choose one out of their favorite hobbies, they should choose based on linear logic sequence (Buchanan, 2004; Makowski, 2009). This assumption is the main element of classic choice (individual and group) theory (Volij, 2002; Hamada et al., 2006; Galichon, Henry, 2012), which can be used to analyze the problems of people' rationality in daily life, where all calculated ranges and ratings are treated as transitive. As stated by Makowski (2009), any connection "more – less" (>), exists between specific elements A, B and C, is called transitive, if the result A > C is received from the fact, that A > B, and B > C. If this condition is not satisfied, the connection is treated as intransitive. Intransitive connections are often interpreted as something paradoxical. In other words, **intransivity means that,** even though the assumption is kept, that all people are rational (and the application of all Game theory principles is based on this assumption), is proved, **that in some cases people take a priority to irrational decisions.**

One of the main situations, which is analyzed by the economists and analysts of Game theory situations, is a phenomenon, called "money vacuum" or "money pump" (Gustafsson, 2010; Echenique et al., 2012; Smeulders et al., 2013; Gustafsson, 2013 and other). Let us say, that a player keeps to a clearly denoted intransitive priority: he takes a priority to event X against event Y, event Y against event Z, and event Z against event X. Event X depends on the player's will, for example, the player is the owner of a specific property X. The player is offered with the possibility to change property X to property Z for one euro, and the player accepts it. Then he is offered with the possibility to change property Z to property Y for one euro, and the player accepts again. Finally, he is offered with the possibility to change property Y to property X for one euro, and the player accepts again. Such sequence of transitive (rational) events finally impacts paradoxical result: the last property, received by the player is property X, which has belonged to him earlier.

Despite the fact, that intransitivity seems to be an opposite to human's intuition at first sight, however many examples of intransitivity can be found in real life. They can bring positive results, even though people do not pay attention to it often. Let us take a situation example in sports. Team A, which has won against team B, can be defeated by team C. Due to uncertainty, which team is going to win, the result of a game is more unpredictable and excited. Similar situation is in a popular game "A well, paper and scissors": scissors fall into a well, but cut paper, and paper covers a well. The result in these type of games is totally unpredictable; and no dominant players or dominant strategies are present in such games, a player just participates in a game without knowing, who is going to win in advance.

Analyzing the problems of intransitivity, it is worth mentioning the games with public products, which are used as a model to analyze social relationships and interaction between separate groups of individuals. As identified by Makowski (2009), the players, who participate in such games, maintain relationship for the dynamics, which is common in "A well, paper and scissors" game. The best known and socially meaningful example of intransitivity is Condorcet voting paradox (voting is a public phenomenon) (Kurrild-Klitgaard, 2001; Gehrlein, 2006; Gehrlein, Lepelley, 2010 and other). Based on the definition of this paradox, when three or more people try to make rational decisions, common collective decision will not be necessarily rational (Kurrild-Klitgaard, 2001). It is so, because each individual rational player can choose from couple alternatives, which seem to be the best for him. However, the alternatives, chosen by separate players, mix among themselves, and the final combination of the chosen alternatives will not necessarily be the best.

Many researchers (da Costa et al., 2009; Jadlovska, Hrubina, 2011; Myerson, 2013 and other) believe, that the players take priority to rational choice, whereas intransitive (irrational) choice is possible only when other decisions are made carelessly. Others try to combine the reasons for intransitive choice with the principals of rationality (Fishburn, 1991; Makowski, 2009; McCain, 2014; Dixit, Skeat, 2015 and other), admitting, that irrational decision making not always contradicts the interests of the players. Of course, in real life various options are possible, and it is important to remember, that what seems rational in one situation, can seem totally irrational in another situation. For example, analyzing business area, it could be very rational to raise prices for a company in economic rise period, because aggregated demand for goods and services is big. However, in conditions of economic recession, more rational decision would be to reduce prices and maintain current customers, even when profit reduces. That is why it is not possible to state, that only price increase strategy is always rational. The player has to identify strictly, what is rational in each situation, and it is not always an easy task, because the player can interpret rationality differently, depending on the criteria of a subjective assessment.

Summary *– rational and irrational decisions can allow to achieve optimum results (Makowski, Piotrowski, 2005; Makowski, Piotrowski, 2006; McCain, 2014 and other). Even though many games are based on rational decisions, the refusal of totally irrational (intransitive) decisions and their rejection in analysis is unacceptable and unreasonable, because it is characteristic for a person to develop a sequence of ideas and think not only logically, and constant change is characteristic for the environment. Consciousness and unconsciousness (intuition) are important elements of human behavior, therefore assessing your own perspectives in various type of games, it is worth considering rational and irrational aspects of players' behavior.*

2.3. The positions of players in typical game situations

Matalobos et al. (2005) describes typical co-operative and competitive game situations and the ways how to achieve strategic equilibrium in various type of games. The following are the main ones:

1) Zero-sum games, where strategies are applied seeking for so called "*saddle point*";
2) Non co-operative variable sum games, where the players seek for Nash equilibrium;
3) Co-operative variable sum games, where the players seek for Pareto optimum;
4) Hierarchical and nonhierarchical games, which differ from one another in players' power;

In order to understand, what goals does each of the game strategies reflect, the authors Da Costa et al. (2009), illustrate with the following statements, which denote the players' point of view towards a situation:

1) Zero-sum game: "If possible, I would like to destroy my competitors; if it is not possible, I would like to make them weaker, so that they were not able to threaten me in the future" (strict competitive or fighter's attitude).
2) Non co-operative games: "My competitors exist, and they have a right to exist, because there are many opportunities in a market for everyone. However, I admit, that we will always have conflict of interests among each other. I will act so, that to acquire and maintain space, which is necessary for my survival and growth" (individualistic or combative attitude).
3) Co-operative games: "I need to survive, as my competitors do. Therefore, it should be possible to find a certain relationship form, which would allow us to coordinate actions and make a decision, which is the best for all of us" (associative or communicative attitude).

In order to simplify the analysis of a game, it is assumed, that all these three types of approaches are possible to make into actions, and that they would be variously distributed among different players. These various type of attitudes visually reflect the players' behavior and actions, which they undertake in conflict of interest situations. Typical situations, where one or other out of three named approaches dominate, and expected results from these situations, and their ethical assumptions are provided in Table 17.

Table 17. Typical situations and results of players' different attitudes

Player's attitude	Typical situation	Expected results	Ethical assumptions
Strict competitive (fighter's)	Predatory competition	Eliminate or make the competitors weaker	Do anything to survive
Individualistic (combative)	Loyal competition	Win and survive	Win with dignity, not at any price
Associative (communicative)	Alliances, agreements, partnerships	The best possible result for everyone	Principle "one for all, and all for one"

Source: compiled by the authors with the reference to da Costa et al., 2009, p. 140.

As seen from Table 17, three separate and not related players' behavior types and attitudes against other players are shown: strict competitive, individualistic, and associative. The main goal of strict competitive player is to make the competitors significantly weaker or eliminate them from a market. A player, who has individualistic attitude, does not seek to eliminate his competitors, he only wants to win a competitive fight and survive in his chosen business area, however, he will not take drastic measures to achieve this goal. Finally, a player, who has associative attitude, seeks for a result, which would be the best for all the players. Such player is willing to make partnership agreements and seeks for co-operation. It is noted, that assessing equilibriums in specific game situations, it is not considered, whether the chosen position and its attitude are subjective (based on personal attitude towards game situation), or objective (explained through economic motives, seeking for the survival of the company in the market). The attention is focused on what the player's position is the most expected.

Having assessed typical game situations, it is very important to pay attention not only to the player's attitude, behavior, but also to his power level in a market, because it impacts different type of games. The authors da Costa et al. (2009) distinguish the following players' power levels and provide such definitions:

1. High power level: "I am stronger than my opponents and I can impose my interests to them".
2. Balanced power level: "I am like many other opponents; me and the main my opponents, we have equal power".
3. Low power level: "I am weak and cannot force my opponents to act according to my interests; I am willing to wait, if possible, till my strongest opponent decides, what actions to take, and then I will make my decision".

It is assumed, that a specific player's power level impacts his actions in a game, while analyzing players' attitude and power level. Typical situations, when one or another player's power level dominates, expected results of such situations together with ethical assumptions are described in Table 18.

Table 18. Typical situations and results assessing players' different power levels

Player's power level	Typical situation	Expected results	Ethical assumptions
High power	Monopoly, control, and regulation	Maintenance of the highest position	Player creates rules and makes profit from them
Balanced power	Free market	Victory	Player wants to win according to rules
Low power	Business start or end stage	Survival	Player can do everything in order to survive

Source: compiled by the authors with the reference to da Costa et al., 2009, p. 141.

As seen from Table 18, the player, who has high power, seeks to maintain his position as a market leader; often such player is even market monopolist, who creates rules and makes profit from them. Other competitors' presence in a market, in his view, is not accepted. Balanced power player often acts in free market economy, in oligopoly or perfect markets, where the rules of a game are set, and the players keep to them in order to undertake the best position. Finally, low power player is often a market newcomer or a subject, who loses his position in a market, for example, a company at the beginning or end of a cycle. Such player usually understands, that his positions become weaker and he seeks for the survival by any available means. So, a statement can be made, that the players' power level can be balanced or non-balanced (high or low power). The players, who have balanced power level, are willing to co-operate, and the players, who have non-balanced power level (very high or very low power) are not willing to co-operate (Da Costa et al., 2009). As assessing the players' attitude and behavior, in this case, the attention is not focused on what strategy the player undertakes, whether he acts morally or immorally against other players. The only assessment is made on how a separate player's power level can impact his actions in a specific game.

Having overviewed possible players' attitude, behavior options, and the levels of power, let us come back to the typical analysis of game situations.

Two players' zero-sum game is the most simple game situation, which has been analyzed for the first time by J. von Neumann and O. Morgenstern (1944). Only two players with equal opposite payoffs participate in this situation. In zero-sum games, the players search for the strategies, which would be the best (dominant) for participating players. As noted by Venclauskaitė (2000), co-operation in zero-sum game between the players is not possible, because their interests are totally opposite, it is assumed, that "what is good for me, it is bad for my opponent", and on the contrary (El-Karoui, Hamadene, 2003). One player wins, what the other player loses in zero-sum game. Therefore, the payoff of a game is always a specific denoted size (for example, 100 % of market) and the structural parts of this size can be distributed randomly between the players. McCain in the book "Game Theory" (2014), compares zero-sum game with the game of even and odd numbers. Let us say, that the first player chooses even number, and the second player chooses odd number. Then each player shows one or two fingers at the same time. If the number of shown fingers matches, the result received is even and the first player wins. If the number of shown fingers does not match, the result received is odd and the second player wins. Another example is, if a player wins 1000 EUR, participating in a zero-sum game, it means that he takes away this 1000 EUR from another player. One of the players always wins, but both players can never win together. It means, that there is no pure benefit between the players in a zero-sum game (McCain, 2014).

The following main features of two players' in a zero-sum game are distinguished (Fear, Denniss, 2009):

- Zero-sum game is characterized by a strategy, which is chosen by every player (for example, the result of a game can be even or odd, independently on what each of the player's has chosen);
- Payoff matrix of zero-sum game shows positive or negative benefit for one of the players, when benefit of the second player is inverse to benefit of the first player;
- Payoff in a zero-game matrix can be measured by various units, however these units have to express whole or single benefit.

It is assumed, that in zero-sum games (as in other type of games), participating players are rational. What is more, it is assumed, that both players are selfish in the sense, that they choose a game strategy paying attention to their own interests and seeking for their own benefit only. The examples of zero-sum games in business are trade in goods in the sense, that in trade for every won (earned) monetary unit, lost (spent) monetary unit is present and on the contrary.

Zero-sum games, occurring according to consistent and simultaneous actions strategies (see 2.1 subchapter), are analyzed differently. If a zero-sum game occurs according to consistent actions strategy, a player, who makes the decision first, automatically appears in less favorable situation, he is not sure, how will other players reply to his actions, and if that action will be successful. This shows, that knowing information in advance is very important in a game. If a zero-sum game happens according to simultaneous actions strategy, when the players make decisions at the same time, without knowing, what decision will be made by an opponent, then they play in equal "fog" conditions.

However, game situations occur, when a game is of zero-sum, and the players' interests are totally different, but each of the players have more than two possible strategies. Such situations are analyzed according to Minimax theorem, which has been proved by J. von Neumann in 1928. Based on Minimax theorem, every *m x n* matrix game has its own decision. According to Venclauskaitė (2000), a unique number *v* exists, which is called game value, and optimum (pure or mixed) both players' strategies. If in a game matrix a row player chooses an optimum strategy for himself, then his payoff will be equal to the value of a game *v* or bigger than it, regardless of the strategy, chosen by a column player. Analogous situation is with a column player: if in a game matrix a column player chooses an optimum strategy for himself, then his payoff will be equal to the value of a game *v* or bigger than it, regardless of the strategy, chosen by a row player. However, if one of the players keeps to his optimum strategy, and the other deviates from it, such deviation is never beneficial for the first player. In the best scenario, deviation of the second player from his initial strategy does not change the payoff of the first player, but in the worst scenario, deviation of the second player from his initial strategy reduces the payoff of the first player.

As seen from the named definitions and traits of zero-sum games, zero-sum, positive sum (or positive payoff), and negative sum (negative payoff) are the definitions, which in business area mean the result of negotiations, contract, or a deal, which could be money, land, saved time, increased productivity, increased sales, new customers attracted and other. Even though these definitions sound similar from the first place, they differ from "win and win", "win and lose" and "lose and lose" games (Spangler, 2003), because the latter games reflect not the final result, but the wining or loosing against the set expectations.

In a zero-sum situation, when one player cannot get benefit without making worse other player's position, winning, and losing give a result of different directions, and general result of a game is equal to zero. According to Spangler (2003), negotiations of resource distribution are often typical to this type of situations, when the amount of resources is limited and negotiating players give advice to

each other, what amount of resources should each of them receive. This is like sharing a pie, when a pie is the way it is, and it is not possible neither to make it bigger nor smaller, just to agree how to share it. For example, two branches of the same company can consult each other, how to distribute limited budget of the company among them (since the budget is limited, the bigger part one branch receives, the smaller part remains to another branch). Another example can be the case, when there is only one vacancy in a company and one candidate gets a job, and another does not get it (finding a job for one person is a win, and a loss for another, and the general result is equal to zero).

Positive sum result is received, when general sum of winning or losing is bigger than zero. This is possible, if a pie can be made bigger, for example, resources increase, which the players want to share or they assure, that each player will get as many resources as he needs. It can be done in various scenarios. For example, if we are talking about financial resources or distribution of a budget, besides possessed budget, external financing resources can be found, which help to assure, that both branches of the company will receive as much financing as they need. What is more, so called integrated negotiations method can be used, when different interests can be aligned between each other, and the needs of all participating opponents are satisfied. For example, one branch (suppose the one, which gets bigger financing) can agree to take over certain job from another branch (which receives lower financing) and complete these jobs with lower costs. Of course, this would require additional costs at the beginning, however it would become balanced in long term and the amount of money, designated for financing, would not be exceeded. The more different the player's interests are, it is more likely, that the negotiations and discussions will help to find the ways to get positive, but not zero-sum from the game.

As noted by Spangler (2003), negative sum games are the biggest problem in games, because "the pie" becomes smaller (shrinks). Finally, total payoff sum, adding the value of winnings and losses, is lower than zero. This means, that the only way for the players to keep their current positions and accept something from an opponent (either it is winning or losing). However, even in such case, if each player accepts his part of loosing, all the players lose anyway, comparing their position after the game with the position, which they had before the game or with the position they intended to have entering the game. Such situation often creates serious competitiveness without any compromises. However, as noted by McCain (2014), the result of negative sum games is not always "loosing and loosing" because if the players know in advance, that the "pie" becomes smaller, they can reduce their expectations. Often example of negative sum conflict could be the distribution of reduced budget inside a company. In this case, each department expects, that after the reduction of general budget, each department will get reduced financing part.

What result is going to be (winning or losing), depends on how much money a certain department is going to get in comparison to the amount needed for the most necessary things. Let us say, that if the department could survive with the budged, reduced by 30 %, but the budget has been reduced by 20 % only, the result of the game will be positive.

Paying attention, that the results of a game could be zero, positive and negative sums, besides zero sum games there are so called non-zero-sum games as well. Based on information from Stanford University (2003), zero sum games differ a lot from non-zero-sum games, because in the latter, an optimum decision in conflict of interests' situations can always be found, and this better reflects usual conflicts of modern world, when problems, which raise, often do not impact direct results, which are analyzed in the models of zero-sum games. Non-zero-sum games differ essentially from zero-sum games, because they do not contain any universally accepted decision. This means, that no optimum strategy is present, which would be a priority for all the players. Besides, no exactly predictable consequences are also present. Non-zero-sum games are not strictly competitive, as zero sum games; they can cover competitive and co-operative game elements. The players, who participate in non-zero-sum game, have specific compatible interests, as well as contradictory interests.

Typical example of non-zero-sum game, is provided in scientific literature (information from Stanford University, 2003; Zhao et al., 2008; Lau, Mui, 2008; McCain, 2014 and other), is *The Battle of the Sexes*. This example portrays a husband and a wife, who want to go out in the evening. They have to decide whether to go to a ballet or a boxing game. Each of them wants to go together, not separately. Even though a husband would like to go to a boxing game, he prefers to go to a ballet with his wife, rather than going to a boxing game alone. Also, a wife would like to go to a ballet, but she prefers to go to a boxing game with her husband, rather than going to a ballet alone. *"The Battle of Sexes"* game matrix is shown in Table 19.

Table 19. "The Battle of the Sexes" game matrix as non-zero-sum game

		Husband	
		Boxing game	Ballet
Wife	Boxing game	2,3	1,1
	Ballet	1,1	3,2

Source: Information from Stanford University, 2003.

The first digit in decision couple shows wife's payoff in a game matrix (see Table 19), and the second digit shows husband's payoff. The game matrix shows, that the situation of the game is not strictly competitive. A husband and a wife have a common interest to be together even though their hobbies differ. It is important to pay attention to the communication power between the players, while analyzing such type of games. It is usual to believe, that the ability to communicate can never bring negative consequences to a player, because a player can always refuse a right to communicate. However, the *refusal* of communication differs from *inability* to communicate, which can bring negative consequences to a player in most of the cases.

Example of "The Battle of the Sexes" seems to be a dilemma, which can never be solved. However, this problem can be solved, if a husband or a wife limits the alternative choices for another person. For example, if a wife buys two tickets to a ballet, showing that she does not want to go to a boxing game, a husband must go to a ballet with his wife, and doing so he maximizes his own interests, because he wishes to go out together. Since a wife buys two tickets, husband's optimum choice is to go with his wife. If he has gone to a boxing game alone, he would have never maximized his own interests.

As seen from the example above, in the case of non-zero-sum game (or variable sum), the payoff of participating players if bigger, than a constant 100 % sum. Nash equilibrium can be achieved in this type of games, if the players have the same interests. Let us say, that if two business companies participate in a game, then their payoff will be profit earned. So, the higher profit is, the better of the companies are. The analysts, from University of Santa Barbara (2011), provide such an example, when two fast food companies "McDonald's" and "Burger King" participate in a game (see Table 20):

Table 20. Matrix example of variable amount game between two fast food companies

		"Burger King"	
		Valuable food	Junk food
"McDonald's"	Valuable food	2,2	4,1
	Junk food	1,4	3,3

Source: compiled by the authors with the reference to information from University of Santa Barbara (2011).

As seen from Table 20, both fast food companies get the biggest joint profit providing valuable food. Nash equilibrium in this game is achieved in the upper left matrix cell, where the payoff is equal to (2,2). The payoff in this case is symmetric for both players.

The games, where both players choose the same priority, are called symmetric games. None of the players have privileged position in these games, and the payoff from a game depends on the chosen strategy, and not on what players participate in a game. In other words, the players can be replaced in symmetric games, and this will not impact the payoff of the strategies. The most researched classical 2x2 games are symmetric. One of the most popular symmetric game examples is "Deadlock", its matrix is shown in Table 21.

Table 21. Symmetric "Deadlock" game matrix

		Player 2	
		To co-operate	Not to co-operate
Player 1	To co-operate	1,1	0,3
	Not to co-operate	3,0	2,2

Source: Information from Stanford University, 2003.

The players of "Deadlock" game have two possibilities: to co-operate or not to co-operate. It is more profitable not to co-operate for each player, despite what decision will be made by the opponent. Not like in "Prisoner's dilemma" (see subchapter 2.4.1), it is not profitable for the players to co-operate in "Deadlock" game. The game is called "Deadlock" because the players have no possibilities to co-operate. Sometimes such situation is present, when, for example, two countries do not agree and prepare to arm, and none of them wants to stop. But if they do not stop to arm, they have no possibilities to find an agreement.

Philosopher Jean-Jacques Rousseau (1755) has introduced so called "Stag hunt" situation, which has been described the following: in early communities people tended to unite, in order to hunt a stag. If one person out of a group refused to help in hunting, a stag could have not been hunted. Hunters sometimes did not hunt stags, but went after the rabbits (it was enough only one person to hunt a rabbit). However, the priority was to hunt a stag, because it provided with more food recourses. Looking from the Game theory perspective, the best strategy in this situation is to hunt a stag (bigger benefit is received from a game), but people were afraid, that some of the group members can decide not to join the stag hunt and go to hunt rabbits. Conflicting countries can also occur in a similar situation,

especially those, which create or acquire nuclear weapons. Each of the conflicting countries believe, that it would be better not to use nuclear weapons. However, the temptation to expand the arsenal of nuclear weapons increases, because each of the countries is concerned, that its opponent can expand the reserves of nuclear weapons secretly and create danger not only to its opponent's but also to international safety.

However, asymmetric games are also present (Aras et al., 2005; Tavoni et al., 2011; Dixit, Skeath, 2015 and other). Asymmetric games are such games, where no identical sets of strategies are present for both players. The examples of asymmetric game could be ultimatum games (Eckel, Grossman, 2001; Buchan et al., 2005; Charness, Gneezy, 2008 and other) or dictators' games (List, 2007; Branaz-Garza, 2007; Engel, 2011; Schulz et al., 2014 and other), where each player has different strategies: a player raises benefit or lost condition to other player, and the latter decides whether to fulfil this condition or not in ultimatum game; one strategy is chosen in dictators' game, in order to affect the behavior of other players from one side. The players are not in equivalent positions in both cases.

Summary: *asymmetric games can be hierarchical or unbalanced. Differently from symmetric games, where the players' personalities have no impact to a game and the players can be replaced, but the strategies of a game remain the same, hierarchical games involve the players with different positions. In such games, more powerful player decides on his strategy and tells about it to another player, who is forced to apply Stackelberg strategy then. In other words, hierarchical games are such games, where the leaders (the most powerful players) first take actions in a game, and weaker players take the follower's strategy and simply react to the strategy of a leader (Da Costa et al., 2009).*

2.4. Strategic interaction forms in Game Theory

In Neoclassical economy, a rational person (business subject) encounters a specific environment in his activity, which consists of institutions, property rights and market competition. This person (a player) must look at this environment seeking for the best result of a game, maximization of benefit (profit). However, according to Neoclassical economy principles, a person, who is acting, must pay attention to his own interests only, despite the interests of other players. Only keeping to these principles, it is not possible to explain the decisions, made in limited competition conditions (oligopoly) or decisions, which are made, when property rights in a country's legal system are not properly positioned. What is more, Neoclassical economy does not explain the decisions, made outside the limits of purely monetary relationships. Game theory strategies, based on this point of view, are more advanced than Neoclassical economy theory, because they allow to explain economic and strategic subjects' behavior, when these subjects interact directly, not indirectly, which means through the market. The main strategic interaction forms between the players and the situations, when these interaction forms can be met or applied in real business conditions, are described in this subchapter.

2.4.1. Prisoner's dilemma

The theoretical description of so called Prisoner's dilemma is a situation with two prisoners, who have conducted a crime together and are interviewed in different rooms. Each of them has a choice to confess a crime and witness against each other or neglect committing a crime and not to witness against each other. If a suspect A does not confess, then a suspect B having confessed a crime can expect better conditions for himself (for example, shorter imprisonment term, release and other). A suspect A can also expect the same benefit, if suspect B will not confess. What is more, if a suspect A confesses, it is better to confess for a suspect B as well, in order to avoid a very strict punishment. Likewise, if a suspect B confesses, it is better to confess for a suspect A, than not to confess. So, the only Nash equilibrium in this game is to confess for both suspects. Having confessed both suspects, not only Nash equilibrium is achieved, but also the equilibrium of a dominating strategy, because each player has one optimum choice regardless of the choice of other suspect. However, despite the expectations of both suspects to receive bigger individual benefit after having confessed the crime, the biggest benefit could be received, if none of the suspects confessed, their guilt could not have been proved and both suspects could have avoided a punishment. This could be possible if both suspects would have made an agreement about the strategy not to confess in advance and each of the suspects should have kept to this strate-

gy till the end. The latter co-operation strategy is effective according to Pareto optimum benefit principle, no other strategy is present, which would allow to expect bigger benefit for both players. Whereas an individual action strategy (when one or another suspect confesses) is not effective according to Pareto optimum benefit principle. It means, that acting in an agreement, both suspects could get bigger benefit, rather than acting individually. However, the main problem arises, that it is difficult to align both suspects' actions since none of them is sure to trust each other.

McCain (2014) gives an example, where two big cigarette and tobacco manufacturing companies compete with each other and consider, whether to advertise their products on TV or not (only in those countries where it is permitted, since many countries, including Lithuania, have prohibited advertising tobacco products on TV). It is assumed, that if none of the companies advertise their products on TV, both companies will share the market equally, and reduce their general costs (do not incur the costs of advertising on TV).

Lower costs determine higher profit for both companies, which they also share in approximately equal parts. If both companies advertise themselves on TV, they once again share the market more or less equally but experience higher costs and obtain lower profit. Payoff matrix for this game is displayed in Table 22.

Table 22. Payoff matrix of the game between large tobacco companies

		Company 2	
		Not to advertise on TV	Advertise on TV
Company 1	Not to advertise on TV	8,8	2,10
	Advertise on TV	10,2	4,4

Source: McCain, 2014, p. 16.

If one of the companies chooses to advertise and the other chooses not to, then the former company conquers a greater part of the market and gains more profit. Relative estimations of the earned profit expressed in points from 1 to 10 are depicted in Table 22, where 1 means the lowest score, and 10 – the highest. The game in its nature corresponds to the terms of the Prisoner's dilemma: leaders of each company contemplate in the following way: "If our competitors are not going to advertise, then we should better advertise since the profit we could obtain would be estimated by 10 points, and not by 8 points. On the other side, if our competitors are going to advertise, we should also advertise because our received profit would be estimated by 4 points, and not by 2 points." Hence, from a rational per-

spective, leaders of both companies finally decide to advertise and the profit they obtain is estimated by 4 points instead of possible 10 points. Rational, but self-interest oriented gaming determines the outcome which is not the most favorable to any of the companies.

The following outcome, i.e. minding of personal interests and making a supposedly rational decision, raises a lot of discussions in the field of modern social science. A number of concepts similar to this can be traced in modern life starting with road traffic, pollution, over usage of underwater resources, and ending up with armament control. Even though the mentioned types of interplay seem to be rather different, they share the same problem, which is also present in the Prisoner's dilemma, i.e. what seems to be rational to a single individual may not be rational to a group of individuals. Although in the original Prisoner's dilemma the interplay between two players is discussed, it is also noticed that this dilemma can be adapted in various ways and include the interplay of many players. On the contrary, in the Prisoner's dilemma there is an assumption that players cannot intercommunicate (i.e. cannot negotiate). However, in reality, game participants can communicate and accept reciprocal obligations. Therefore, the final outcome of the game can be much more favorable to all players, in comparison to the original interpretation of the Prisoner's dilemma. Nevertheless, McCain (2014) notes that it might be difficult for the companies that are competing in business environment to come to an agreement, and it is tough to trust one another. Therefore, it is purposeful to include a third person into the negotiation process (e.g. lawyer or consultant) who could help business companies to officially formalize their reciprocal obligations and pre-establish sanctions for violating them. Country's legislative power can also become some kind of a mediator. For example, the Parliament having adopted a law prohibiting television commercials of tobacco automatically eliminates an alternative in the game, i.e. companies cannot advertise themselves on television. As a result, unable to choose they have only one way – not to advertise, what leaves them with the best shared outcome.

Game analysis based on the principles of Prisoner's dilemma is widely applied both when analyzing interrelations among subjects operating within the country, and when investigating international relations, for instance, between the buyer (retailer) and the seller (wholesaler). Both agreement parties receive the highest benefit when they use another party as an advantage, but only provided that both parties strictly comply with the terms of agreement. An opportunity to receive a short-term benefit is displayed as a usual payoff function DC > CC > DD > CD, where C = co-operation between the agreement parties (benefit), and D = defecting from the terms of agreement (loss) (see Figure 16).

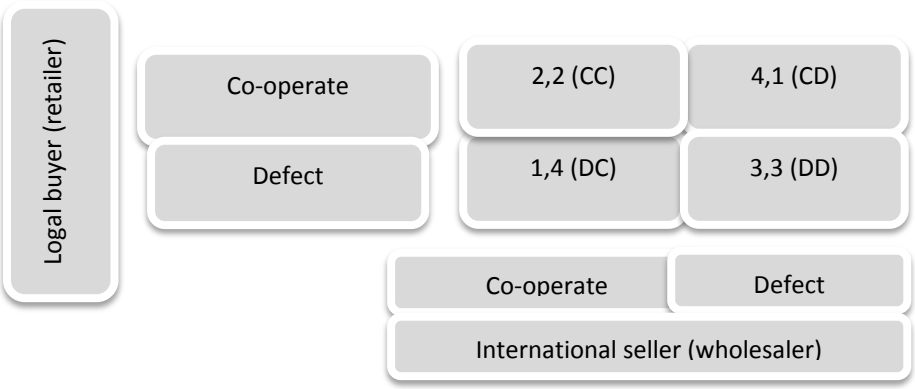

Figure 16. Payoff function of the game between the local buyer retailer and international seller wholesaler based on the principles of Prisoner's dilemma

Source: Reardon, Hasty, 1996, p. 16.

As seen in the Figure 16, the first letter in a two-letter combination shows actions of the local buyer retailer, and the second letter in a two-letter combination stands for the actions of the international buyer wholesaler. For example, letter combination DC means that the buyer is susceptible to break the terms of agreement, and the international seller is willing to co-operate. A contrary function, i.e. CD > CC > DD > DC is typical to the international seller. Both the buyer, and the seller receives the highest benefit as long as the other party complies with the agreement conditions, i.e. the position CD to the international seller and DC – to the buyer. If another agreement party decides to infringe the terms of agreement or cheats, in response to the first party's noncompliance with the agreement conditions, both parties experience the greatest possible loss (DD position). This payoff function is compatible with the gaming in Prisoner's dilemma (however, it is noteworthy that meaning 1 is typically pursued to be the greatest possible payoff in the Game Theory). If both agreement parties do not comply with the terms of agreement or try to use one another, the mutual losing scenario (DD) is reached. Since a buyer or a seller experiences the highest loss when being taken advantage of (i.e. one party is co-operating and another party does not follow the terms of agreement), no incentives remain to continue the co-operation. As a result, the position CD is not a likely decision for either agreement party, except cases when the payoff function changes, having chosen another gaming strategy. Whereas the balance, as described in the Prisoner's dilemma strategy, is the cancellation (or

absence) of co-operation, i.e. position DD, despite the fact that co-operation could bring the highest benefit to both agreement parties.

Payoff function based on the Prisoner's dilemma depicted in Figure 16 is typical of many exchange-based interactions (also characteristic to the buyer and seller's interactions, as seen in the example provided). Having made an agreement, both game participants have the likelihood to gain benefit. The buyer benefits by purchasing the goods intended for a resell at a bargained price. The seller makes the profit having sold these goods to the buyer. Therefore, an unconditional assumption exists that neither the buyer nor the seller shall initiate such an agreement or approve of such an agreement, the conditions of which would not be mutually beneficial. However, during the time period from the agreement's initiation to its implementation both agreement parties have opportunities and short-term motives to cheat. For instance, the buyer can delay the payment, cancel the purchase or return some goods that are faulty or of poor quality. The seller can sell the goods intended for the buyer to other retailer or submit goods of a lower quality. It is likely that any of the mentioned actions can prompt the agreement parties to cancel the agreement so as to avoid the loss. Suppose the seller provides low-quality goods, it is credible the buyer shall refuse to pay. In essence, in such situation both agreement parties should withdraw from the opportunity to take advantage of one another in order to retain the mutual benefit. They should find motives or means to discourage the other agreement party from infringing the terms of agreement.

Considering the fact that players can cheat or take advantage of one another when making a deal, the Prisoner's dilemma sparkled a lot of contradictory contemplations in terms of the supposing right way to game. According to Jones (2007), da Costa et al. (2009), McCain (2014) and others, the choice of a right gaming manner for the most part depends on whether the game is going to be played only once, repeated several times or an unlimited number of times. If it is going to be played only once, the tactics for cheating and taking advantage of the other player is most likely. Behavior of a co-operative nature is characteristic of repeated games, during which a temporary benefit received from cheating is outweighed by the benefit received from a long-term partnership. Therefore, option for co-operation between game participants also exists in the case of the Prisoner's dilemma. Nevertheless, as Reardon and Hasty (1996) note, this kind of co-operation is rather unstable even in a long-term perspective. Even in the best case scenario, agreement parties will have to properly allocate resources throughout the entire agreement period if they choose to pursue co-operation. This would undoubtedly require both plenty of management efforts and financial resources. In addition, when making an agreement with subjects operating in foreign countries, one might need an assistance from the expert in international law, e.g. lawyer or negotiator.

Considering high agreement costs, the retailer shall be less willing to order goods from abroad given circumstances of the Prisoner's dilemma, unless the strategic benefit outweighs the experienced additional costs and hardships. Unwillingness to order goods from abroad may also emerge due to the possibility for the seller to infringe agreement conditions. Due to the mentioned reasons, co-operative relations between the buyer and the seller are considered to be unstable given the circumstances of the Prisoner's dilemma.

Resume: *Internationalization of the trade is observable in an entire world and its rate in Europe is particularly rapid. However, the main problem is that only a small part of business enterprises is aware of how to properly manage the marketing channel when working with international partners. Due to this reason, it is especially important for business enterprises to establish relevant marketing strategies. On the other hand, repeated international purchases can bring success and encourage co-operation even in the case of the Prisoner's dilemma, which would reduce the costs for transaction and information collection on foreign partners. The co-operation between a local and an international player can bring mutual benefits; however, one needs not to stay in those relations for too long. The essence and situations of repeated games are discussed in more detail in the following section of this study.*

2.4.2. Repeated games

In previous sections of this chapter, gaming forms are interpreted as if the gaming *takes place only once* and the *players may never have interrelationship in the future*. Suppose two drivers accidentally meet in the crossroad, the chance that they would meet in the same situation again is indeed small. However, if both drivers live in the same block of flats they may meet on a rather regular basis and get use to each other's habits. Therefore, they can start acting in a completely different way, comparing to how they would act in the case of a single meeting. It is similar to business enterprises competing in the market: their competition lasts year after year throughout the entire period of their activity. If the game took place only once, one enterprise could decide to cheat in one game, the other – in the other game, and etc., and enterprises would not be worried about repressions or sanctions for an inappropriate behavior. However, when games repeat, each player faces new strategic possibilities, and a player can create a reputation for acting differently than he/she would if it was a single game.

Analytics of the Game Theory have soon noticed that outcomes of the repeated games can be rather different from those of a single game especially when solving

social dilemmas. Today a lot is spoken about the so-called folk theorem (Wen 2002; Borgs et al., 2008; Obara, 2009; Kalai et al., 2010; Fudenberg, Yamamotto, 2011 et al.), according to which repeated games quite often influence the co-operation between game participants. *Consider an example of a game between two students who live in one room and try to decide whether to rent a movie for the weekend or not* (the payoff matrix of this game is depicted in Table 23).

Table 23. Payoff matrix of the game between two students regarding a movie rent

		Benas	
		To rent	Not to rent
Arnoldas	To rent	3,3	-1,4
	Not to rent	4,-1	0,0

Source: composed by authors with reference to McCain, 2014, p. 326.

Suppose two students Arnoldas and Benas are participating in the game. Movies for the weekend review can be rented for 5 EUR. Arnoldas and Benas would gain benefit for watching movies on weekend (in this case, free-time entertainment), which is relatively estimated by 4 EUR to each player. Hence, if each player rented a movie, they would gain 8 EUR of benefit. Usually two possible strategies exist in such kind of social dilemmas: to co-operate (i.e. to rent a movie) or to cheat/defect (i.e. not to rent a movie). Having a possibility to negotiate, it is likely they would both choose the co-operative strategy, since their interaction is a long-term (students are going to live in the same room at least for a semester). Therefore, according to "folk theorem" players voluntarily undertake obligations to one another hoping to obtain higher benefit from this commitment, terms of which are often unlimited. All of the possible rational and individual payoffs can be obtained by a voluntary commitment and co-operation.

Nevertheless, Borgs et al. (2008), Kalai et al. (2010), McCain (2014) and others note, the extent to which such perfect strategies prove out depends not only on the game being a repeated one, but also whether the repeated game is being played a definite or indefinite number of times. Suppose it is known beforehand that is going to be played for 20 times, a temptation to cheat in the last game emerges (to play for the last time is almost the same as to play only once – sanctions for cheating/defecting become irrelevant). And if it is possible to cheat in the 20^{th} game, then why it cannot be done in the 19^{th}, 18^{th}, 17^{th} and etc.? In other words, if the game takes place a definite number of times, there is a risk that the players will cheat. If there is no way for the players to co-operate in the last game,

hence there is also no way for them to agree on their actions beforehand. Therefore, when pursuing co-operation, the players have to know that the coordination of reciprocal actions shall benefit to their future co-operation. This knowledge is prompted by indefinitely repeated games where players can unite their strengths for the achievement of the shared goal.

Shared efforts dilemmas are repeated games. Suppose two co-workers – Andrius and Bronius – work in the same project. Payoff matrix of their game is illustrated in Table 24.

Table 24. Sample of payoff matrix for indefinitely repeated games

		Bronius	
		To work	Avoid work
Andrius	To work	10,10	2,14
	Avoid work	14,2	5,5

Source: composed by authors with reference to McCain, 2014, p. 348.

Table 24 shows that the game's dominant strategy is to avoid work. Andrius and Bronius shall play this game once or perhaps several times. They do not know how many times they will have to play, but after some time they will stop. The essence of indefinitely repeated game is that there is always a 10 % chance that this game is going to be the last and a 90 % chance that one more game shall be played. This tendency remains throughout the time projecting the future. As a result, two possible proceedings are available: a 90 % likelihood that there shall be another round of the game and a 90 % likelihood that after this game another game round will start. The likelihood that both of the happenings would take place is equal to 90% x 90% = 81% (according to principles of the Probability Theory). If Andrius and Bronius always avoid work, it is probable that in the future their game's payoff value shall be equal to 50 %. However, based on the "folk theorem" both co-workers can choose the strategy to co-operate under this basis: if one of them avoids work, the second can take revenge in the other game tour by avoiding work. This is so-called "a tooth for a tooth" or "an eye for an eye" strategy, in the Game's Theory literature it is referred to as a "Tit-for-Tat" strategy (Segal, Sobel, 2007; Rand, Ohtsuki, 2009; McCain, 2014; Kursh, 2016, and etc.). A player evoking "an eye for an eye" strategy can influence the opponent's behavior: if Andrius is avoiding work, Bronius shall do the same next time. Since Andrius has interest in his future gain being the highest, a threat that the colleague will not co-operate means an additional workload to Andrius and the like. In this case, the best decision for both colleagues is to work, what would assure them the best

game's efficiency according to the principle of Pareto optimality. Therefore, a strategy "an eye for an eye" works very well.

The functioning of repeated games principles in oligopolistic markets, in which a small number of enterprises-sellers operate, has to be considered. The authors present practical examples in other chapters of the book as well. One of the most important issues in such markets is collusive pricing (Puler, 2006; Berzins, Sofo, 2008; McCain, 2014 and etc.). Business enterprises operating in oligopolistic markets usually have both an opportunity and a problem. An opportunity is that by a mutual agreement or an application of pressure tactics, they can maintain monopolistic prices. In fact, it is not problematic for enterprises acting under the terms of stable oligopolies (e.g. duopolies) to merge. When oligopolistic enterprises keep their prices high without a clear agreement to do so, such a game is called "tactic collusion" (Reynolds, Wilson, 2000; Graafland, 2004; Liu, 2013 and etc.). However, if more than two enterprises (e.g. four or more) operate in the oligopolistic market, a possibility to form a co-agreement is rather vague and everything depends on the circumstances. Suppose two or three enterprises that are competing with a larger company can collude on the pricing strategy; however, this agreement will not cover all the market. By reacting to specific actions, the larger company can start a war on prices against them; as a result, it is rather complicated to maintain monopolistic prices in the oligopolistic market with four or more players.

2.4.3. Strategic pressure game

Strategic pressure game means that the player apprehends he is intensely competing with other players in pursuance to reach the set goal. For example, in business, enterprises can make strategic pressure to one another, when competing for the market share, production expansion, cost reduction and etc. Although, according to Henke et al. (2008), a great part of strategic pressure games take place in intensely competitive markets, games of this kind are available in monopolistic or oligopolistic markets (limitation of the penetration into the market for the new players, cartel agreements on prices and etc.). Strategic pressure games are also called business war games (Chussil, 2007; Kose, Forrest, 2015 and etc.) and are analized according to three theoretical assumptions:

- Business is a war;
- Business is a game
- Business is business.

The assumption that "business is a war" is a direct adaptation of warlike game principles in business. In this case, competitors are considered to be enemies and the goal of the game is to achieve a victory in the market's battles.

The attitude that "business is a game" is based on a presumption that business transactions are games among participants whose goals are incompatible (a conflict of goals occurs).

Finally, an approach "business is business" represents the fact that business is not considered to be neither a war, nor a game – its objectives and tactics are not compatible with goals and tactics of war, and the players are not pursuing to crush each other, instead they are striving to meet the consumers' needs better than competitors can, and in doing so they can employ various means of strategic pressure.

Akash (2014) carried out a survey of business leaders, under which main business areas prone to strategic pressure were identified (see Table 25).

Table 25. Main areas of strategic pressure in business

Area	Percentage of respondents, %
Product area	60
Market area	67
Personal influence area	70
Finance area	50
Consumers' area	61
Other	20

Source: composed by the authors according to Akash, 2014, p. 39.

As seen in Table 25, main business areas for strategic pressure are personal influence area, i.e. strategic pressure on other players using personal authority and social standing (as approved by 70 % of the surveyed business leaders), market area, i.e. strategic pressure on competitors regarding activities in the market and aspects of marketing policy (as approved by 67 % of surveyed business leaders), consumers' area, i.e. strategic pressure on other players in terms of satisfying consumers' needs (as approved by 61 % of the surveyed business leaders) and the product area, i.e. strategic pressure on other players when creating, manufacturing, improving the product and the like (as approved by 60 % of the surveyed business leaders).

The main objectives of strategic pressure on business competitors are also determined in the same research (see Table 26).

Table 26. Main objectives of strategic pressure on business competitors

Objectives	Percentage of respondents, %
Intention to attract consumers and increase the taken market share	80
To increase the company's capability to compete in the market	90
To ensure the product's quality and competitive prices	95
To diversify company's activity and products	50
To improve company's financial situation	85
To gain advantages against competitors	95
To increase the company's power to negotiate	80
Other	78

Source: composed by the authors according to Akash, 2014, p. 40.

As can be seen from Table 26, strategic pressure on business competitors is made in order to ensure the product's quality and competitive prices, as well as, to gain advantages against competitors (as approved by 95 % of the surveyed business leaders). A significant part of respondents (90 % of the surveyed business leaders) highlighted the objective to increase the company's capability to compete in the market. Goals to improve the company's financial situation, attract customers, which in turn increases a market segment, and increase company's power of negotiation (that were marked by 85, 80 and 80 % of the surveyed business leaders respectively) also at a great part determine the initiation of strategic pressure games in the field of business.

In pursuance of the previously mentioned objectives, the strategic pressure game can be implemented in various directions: with suppliers, available competitors in the market, potentially new market participants and customers (see Figure 17).

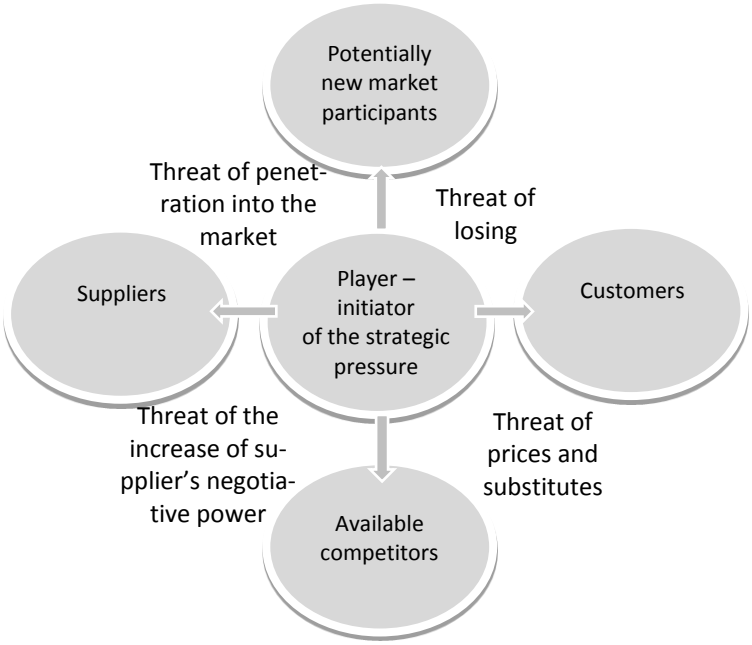

Figure 17. Directions for Strategic Pressure

Source: composed by the authors.

A scheme of directions for strategic pressure presented in Figure 17 shows that strategic pressure on suppliers can be made by threatening not to purchase their (raw) materials or intermediate products or by limiting the purchasable amounts, if suppliers do not satisfy the company's terms (do not reduce the costs, are unable to ensure the required quality, co-operate with unwanted companies, and etc.). In this way, the suppliers' power of negotiation is sought to be reduced. Strategic pressure can be made on the available competitors in the market by increasing, reducing or maintaining prices, presenting or not presenting substitutes to the market, intensity and nature of relations with customers, and etc. Strategic pressure on potentially new market participants is often related with a will to deter them from penetrating into the market (declaring price wars, altering quantities of products to be provided to the market and etc.). Finally, strategic pressure on the consumers can be made by alternating their concentration in the serviced market, increasing costs for shifting between suppliers and the like.

Cases when strategic pressure is based on one of the player's ability to affect other players' intentions or actions have been discussed. Another possible case for strategic pressure described by McCain (2014) is when one player undertakes threats

or promises not to directly influence intentions or actions of other players, but in order to alter the expectations of other players regarding their own future actions and in so doing encourage them to initiate actions favorable to him/her or deter them from certain actions that are unfavorable to him/her. Certainly, in order for this strategy to be successful, threats and promises have to be realistic, i.e. such which would be possible to implement. However, this is usually problematic since when the time comes to fulfil the threat or the promise it can demand additional costs that the player is definitely unwilling to take (e.g. the fulfilment of the threat to decline supplier's services can demand costs for the search of a new supplier, higher costs for making a transaction, and etc.). Several ways to increase the feasibility of threats and promises are analyzed in the Game Theory. The main principle is that the player can be interested in reducing his/her own freedom of future actions. In this way, he/she reduces the temptation to disclaim threat or promise, or to exempt other players from their misdoings. For example, traveler and conqueror Hernan Cortes betook this strategy when having arrived in Mexico he sank all of his ships except for one. This was to show his soldiers that he was not joking about the battle to death, so he even eliminated a possibility to escape. According to McCain (2014), a company "Polaroid" used a similar strategy, when it deliberately refused to penetrate into other markets of photography, except for that of momentous photographs. This was kind of a battle to death against any new players in this market. When a company "Kodak" penetrated into the market of momentous photographs, "Polaroid" mobilized all of its resources for the battle. After 14 years, "Polaroid" won the judicial process against "Kodak" that was worth almost a billion USA dollars and retrieved its monopoly in the market.

Another way to make promises and threats feasible is to invoke a bold risk-prone tactics, i.e. a player intentionally creates risk and constructs barriers for other players in order to ruin their plans. This strategic pressure tactic was introduced by Thomas Schelling in his book *The Strategy of Conflict* (1980). According to the author, it is such a tactic when a situation is let loose from one's hands on purpose, assuming that letting the situation slip from one's hands is intolerable to the opponent. However, it is noteworthy that consequences can be unfavorable not only to the defeated player, but also to the initiator of this tactic: although in some cases the wrecked party withdraws and acknowledges a defeat, sometimes it undertakes the same tactics *va banque* and in revenge can defeat the initiator itself.

Resume: *as Maloni and Benton (2000) note, the power to make strategic pressure is the ability of the player to affect other player's intentions and actions. It is also highlighted that strategic pressure can be made on the basis of different power. For example, influence through intermediary and without intermediate agents, forced and voluntary, economic and not*

economic, and etc. Although often it is perceived that contradictory relations (which are inevitably determined by the use of strategic pressure on the opponent) prevent mutual co-operation in the long term, strategic pressure tactics can be chosen in pursuance of immediate outcomes in the short-term (Henke et al. 2008).

2.4.4. Negotiation

The notion of negotiation in a broad sense has already existed in the old states, where a buyer and a seller used to negotiate in traditional market-places. Nevertheless, from the economic perspective, studies on theories of negotiation began only in XX century, and the Negotiation Theory was attributed to the Game Theory in 1950 under the proposal by John Nash. Negotiation can be compared with sharing a pie: *each player would like to get a bigger piece, but would prefer coming to terms in a good manner, thus, they make each other offers. Consideration of offers and insights on future perspectives determines the game balance in case of negotiation.*

In pursuance of mutual benefit, players often form coalitions. According to Putnam (2010), co-operative coalitions are formed because this allows the players to expect attaining a higher value as compared to that which they would gain when implementing individual action strategies (McCain, 2014). Even so the question emerges, how shall the parties constituting a coalition share this additional value? Authors Bazerman (2000), Brams (2003), Bachrach et al. (2011) and others point out that usually an indefinite number of possible decisions is typical to the co-operative game. On the other hand, as McCain (2014) claims, in order for some players to participate in the game (in the case of the co-operative game – in the coalition), they have to be additionally payed for that. Therefore, the amount of the extra pay to-be-offered to those players has to be settled. In order to reach the mutual benefit, members of the coalition have to establish game conditions in advance, which is being done through negotiation. Furthermore, it is important to agree on the means of sharing the received benefit.

According to McCain (2014), it is often assumed that negotiation takes place between two potential agreement parties, thus the same assumption is retained in the Negotiation Theory. Negotiation is perceived as a submission of offers and requirements that lasts as long as the negotiating parties reach an agreement or declines any attempts to form a coalition. The computation of Shapley value provides the answer on how the benefit is going to be divided among the coalition members. An advantage of computation of the Shapley value is its applicability to coalitions of any size. However, it is crucial to note that some assumptions used when computing Shapley value do not conform to the typical conditions of negoti-

ation practice: assumptions do not include any alternative for refusing to form a coalition even when the negotiating parties fail to come to terms. In other words, when pursuing negotiation under real circumstances, one needs to consider the risk of discontinuing the negotiation, the fact which is not taken in consideration in computation of the Shapley value.

Nonetheless, is negotiation a part of cooperative or uncooperative game? According to McCain (2014), offers, counter-proposals or presentment of requirements seem to have a connotation of an uncooperative process, where each player seeks self-benefit disregarding interests of other players. Indeed, if it is a transferable utility game (Predtetchinski, Herings, 2004; Habis, Herings, 2011, and etc.), then a possible game value is a fixed amount and the players will never be interested in co-operation, but will strive to receive the greatest share of the fixed value and will negotiate for it (Habis, Herings, 2011). On the other hand, if the unticipated game value is not a specific and strictly defined amount, all players can benefit from the game. In this case, the role of negotiation is even more important. As McCain (2014) notes, negotiation is like a bridge between the games of cooperative and uncooperative nature. Therefore, it is crucial for the players to properly coordinate their strategies during the process of negotiation.

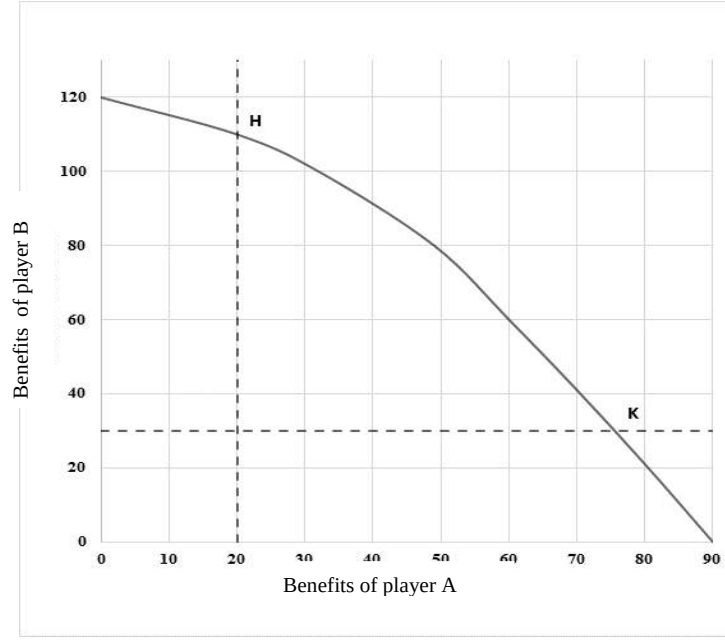

Figure 18. The utility possibility frontier in the negotiation game between two players

Source: McCain, 2014, p. 417.

In accordance with compatibility of the strategies and presence or absence of particular side payments (for example, payments to a negotiation consultant, an intermediary of a transaction, etc.), players' benefits and utility possibility frontiers can be estimated (see Figure 18).

The horizontal axis in the diagram in Figure 18 depicts the benefits (payoffs) of player A, while the vertical axis depicts the benefits (payoffs) of player B. While assessing the opportunities of mutual benefits, only the points, in which Pareto efficiency is achieved, are considered, i.e. only the points, in which the benefits of any of the players cannot be increased without decreasing the benefits of the other, are taken into account. If both players coordinate their strategies, negotiate and adjust the strategies which do not lead to Pareto efficiency, they may create more Pareto efficiency points in a particular game. The downward sloping curve shows the highest benefit limit for player B under the given benefit of player A on the horizontal axis, or the highest benefit limit for player A under the given benefit of player B on the vertical axis. This curve is called the curve of *utility possibility frontier (UPF)*) (Kletzer, Wright, 2000; McCain, 2014). Neither of the points below or over this curve is Pareto efficiency point, i.e. there are no possibilities that both players can adjust their strategies so that the benefit of one player would increase without the decrease in the benefit of the other player. Let's presume that player A can expect to get the benefit that is equal to 20 benefit units (McCain (2014) proposes to use this term instead of the term monetary units, for example, 20 EUR, because players' benefits are not always monetary) if he will not coordinate strategies with player B, but will act independently. It means that player A will not accept any proposals that could ensure the benefit lower than 20 benefit units. Then, from the curve of utility possibility frontier, we can eliminate the points, in which player A gets the benefits lower than 20 benefit units, i.e. all the points to the left from point H are eliminated. Similarly, let's presume that player B can expect to get the benefit that is equal to 30 benefit units if he acts independently. Then, all the points to the right from point K are eliminated. Hence, if players A and B act independently, player A gets 20 benefit units, and player B – 30 benefit units. The point, where these values intersect, is called the *disagreement point* (McCain, 2014). But any other point between points H and K on the utility possibility frontier can be reached only when players coordinate their actions. Then, they will simply agree about one or another choice. Which point will be selected is the issue of negotiation.

The problem of negotiation in games can also be solved by employing the attitude of non-cooperation (for instance, when estimating Nash equilibrium). Nevertheless, as it was noted by McCain (2014), Nash equilibrium often does not help to solve the problem. John Nash, the proposer of Nash equilibrium, has also introduced the theory of *Nash Demand Game* (Nash, 1953; Malueg, 2010; Anbarci,

Boyd, 2011; Ohtsuki, 2011, etc.). With reference to this theory, players A and B choose their individual strategies as a requirement for particular minimal payoff (minimal benefit). The requirement for minimal benefit is chosen as one of the points, which are located below the disagreement point, i.e. the point of minimal benefits required by player A can be any point not lower than 20, while the point of minimal benefits required by player B can be any point not lower than 30. If players' requirements intersect in the point on the curve or below it, then each of the players get what he requires (any possible surplus of the benefit is not assessed), and vice versa – if players' requirements intersect in the point over the curve, neither of the players gets what he requires. So, if player A knows that player B requires 100 benefit units, the best response to this requirement is to require 30 benefit units (by the curve of utility possibility frontier) because any other value lower than 30 would decrease the position of player A. This way, Nash equilibrium in this game is reached in the point [100;30]. This is inherent to each point on the curve of utility possibility frontier.

However, as any Pareto efficiency point is Nash equilibrium, Nash equilibrium cannot ensure the solution of the negotiation problem. Certainly, scientific literature contains particular improvements of Nash equilibrium, which could help to achieve exceptional results or would allow to form another non-cooperative model. But the basic problem would remain: if player A knows that player B requires benefits not lower than 100 benefit units, he will find it irrational to refuse 30 benefit units, and it very unlikely that the players will co-operate.

The first solution to the negotiation problem that was based on co-operation approach was proposed by Danish economist Fredrick Zeuthen in his book "*Problems of Monopoly and Economic Welfare*" (1930), in which the author discusses the cases of bilateral monopoly, when two companies exchange particular products. One of the companies is only a seller, while the other – only a buyer. This way, different prices of the products can be fixed without any competition, and the benefits (profits) of both companies will vary in the boundaries of the utility possibility frontier curve: higher prices will help to earn higher profits for the seller, while lower prices will generate higher profits for the buyer.

But despite mutual benefits, why should any of the players agree with the benefit that is lower than the highest possible benefit? Zeuthen F. (1930) argues that player B could agree with the benefit that is lower than 110 benefit units if he is afraid that player A can terminate the negotiation. Then player B would have only his minimal benefit equal to 30 benefit units. What is more, player B would have to understand that the higher benefits he requires, the lower benefits he leaves for player A, and the latter can be motivated to terminate the negotiation. Let's presume that there exists probability p that player A will terminate the negotiations if

player B requires 100 benefit units. Then, probable value of 100 benefit units required by player B will be equal to:

$$p(30) + (1 - p)100 = 100 - 70p$$

On the other hand, let's presume that player A offers player B to share the benefits – each of the players may get 60 benefit units. Then, player B knows that he can get 60 benefit units without any risks. If $60 \geq 100 - 70p$, player B will be inclined to accept the offer rather than stick to the requirement to get 100 benefit units. However, for player B, it is not the only possible strategy. Player B can offer player A benefit units the value of which falls into the interval between 30 and 60. At the same time, for himself he would require benefit units with the value higher than 60, but lower than 100. If player B is rational, he will not require 100 benefit units because the risk of negotiation termination in this case would be extremely high. In other words, the risk of negotiation termination is too high for player B when $60 > 100 - 70p$, but if $60 < 100 - 70p$, player B may find it rational to require a more favourable offer and assume the risk of negotiation termination. If $60 = 100 - 70p$, i.e. $p = 4/7$, then the risk of negotiation termination and the requirement for 60 benefit units are balanced.

Nevertheless, it should be noted that the theory of negotiation is relatively abstract, although it is common in modern business. The success and pace of negotiation largely depends on players' knowledge of an opponent and of an object of negotiation: the more knowledge a player possesses, the more successful and faster the negotiation can be, and vice versa. Furthermore, negotiations always cover the aspects of interrelationship – if the opponents share the information about what is acceptable or unacceptable for each party, the probability that the negotiation will be successful is really high. Without any interrelationship, i.e. when the parties do not share the information, the negotiation may fail.

Summary: *the theory of negotiation covers the issues of what benefits can be expected by players if they coordinate their actions, and to which extent these benefits can exceed the ones, which could be earned acting individually. Negotiation helps to ensure rationality when players co-operate because co-operation makes rational particular actions that would not be rational under any other circumstances. Hence, it is important for players to agree not only about the terms of the game, but also about the ways to fairly distribute the rational benefits. In order to do that, even before the beginning of negotiation players must know what minimal benefits are acceptable for them, and then they can try to exploit the opportunities to increase these minimal benefits.*

2.4.4.1. Group games: thinking patterns in intergroup conflicts and negotiations

When one student got married while still being a graduate, his research advisor wrote the following wish in the congratulation card: "Always play C". If we translated this wish from the language of Game Theory, it would sound "Always cooperate with your wife". In a marriage, like in any other types of personal or group relations, behavioural strategy is commonly selected only after precontemplations. It means that, first of all, a decision-maker defines the nature of the situation and identifies which direct or indirect effects could be brought about by this situation.

Interdependent players, as well as interdependent player groups, play different types of games, which are described (Camerer, 2003; Tenbrunsel, Northcraft, 2009; Halevy, Phillips, 2015 and others) as abstract equivalents of strategic interactions. Each strategic interaction is composed of participating players, possible alternatives of strategic decisions and game payoffs (or game benefits), which can be very different in case one or another strategic decision is chosen (Bornstein, 1992, 2003; Camerer, 2003; Kelley et al., 2003; Plott, Smith, 2008; Wildschut et al., 2003 and others). Behavioural Game Theory explains how individuals or groups tend to behave in particular games. The researchers state that treatment of the situation can serve as an important factor which determines what decisions will be made by a player (Bazerman et al., 2000; Brandenburger, Nalebuff, 1996; Tenbrunsel, Northcraft, 2009). For this reason, it is purposeful to analyse players' considerations in interpersonal and intergroup games (Devetag, Warglien, 2008; Halevy et al., 2011; Halevy et al., 2006; Kiyonari et al., 2000; Kelley, Thibaut, 1978; Plous, 1985and others).

Thinking patterns in conflicts and negotiations

Minding the facts that different types of conflicts occur in different areas of life and conflicts may have a significant impact on both individual players and player groups, players often try to give particular meaning to their interpersonal and intergroup relations (Ross, Nisbett, 1991; Weick, 2001). The processes of meaning creation usually finish with a subjective perception of possible conflicts, and this perception forms subsequent thinking and behaviour of a player (Chambers et al., 2006; Robinson et al., 1995; Vallone et al., 1985). Scientific and psychological literature on negotiation presents the concept of a thinking pattern as a fundamental concept, which covers numerous possible perceptions and beliefs, as well as many possible definitions of reciprocity. According to Bazerman et al. (2000), an

individual thinking pattern is a cognitive depiction of negotiation, which includes individual perceptions of oneself, one's relationship with other subjects of negotiation, perceived characteristics of other gamers and knowledge of the structure and process of negotiation.

The interest of social scientists in individual thinking patterns applied in conflicts and negotiations inspired several new directions of research, such as the impact of a decision model on strategic interaction (Gneezy, Rustichini, 2000; Tenbrunsel, Messick, 1999) or the impact of stereotypes on strategic interaction (Camerer, 2003, Kvist, 2004; Halevy, Phillips, 2015). The researchers proved that different stereotypes that dominate during the time of a single interaction (Liberman et al., 2004) or separate interactions (Larrick, Blount, 1997; Zhong et al., 2007) may have a significant impact on the behaviour of players. Although the structure of payoffs in scientific experiments was considered to be stable (for instance, it was presumed that all gamers are involved in a Prisoner's dilemma), the changes in the conditions of the situation as well as the changes in available strategies completely modified players' attitudes towards a choice, a meaning that was given to each of the choices, and ultimately – towards the final choice.

The other direction of scientific research is the analysis of conflict environment (De Dreu, Weingart, 2003; Jehn 1995; Pinkley, 1990; Pinkley, Northcraft, 1994 and others) or conflict schemes (Bar-Tal et al., 1989; Golec, Federico, 2004; Sherif, 1966 and others). The research of this type is primarily aimed at investigation of how individuals perceive incompatibility of their and their opponents' goals, commonly making a distinction between co-operation and competition schemes. The scientists, who analysed the problems of negotiation, proposed the term "*fixed-pie bias*", which is used to describe the inclination of players to wrongly think that their interests are completely incompatible with the interests of their opponents (Bazerman et al., 2000; De Dreu et al., 2000; Thompson, Hastie, 1990 and others). Van Boven and Thompson (2003) summarised this tendency by noting that the variety of negotiation participants' thinking patterns can be really wide – from stable patterns to integral thinking patterns. The selection of one or another pattern depends on how a player understands possible outcomes of a game in the situations of a conflict or negotiation.

Perception of possible outcomes in the situations of a conflict or negotiation

As it was noted by Halevy and Phillips (2015), both the situations of a conflict and negotiation share the common feature – dependency on different structural components, such as the number of participating players, congruence or incongruence of expected results and different aspects of interaction (simultaneous or succes-

sive decision making, single or repeated interaction, etc.). De Dreu (2010), Kelley et al. (2003) and Rubin and Brown (1975) note that dependency of one or another type is the main feature of conflict and negotiation situations. Extended typologies of Game Theory (Camerer, 2003; Luce, Raiffa, 1957; Plott, Smith, 2008) and Interdependence Theory (Kelley et al., 2003; Kelley, Thibaut, 1978) highlight both quantitative and qualitative differences among various games. The researchers analyse peculiarities of a thinking process to explain irrational behaviour of players in the course of a strategic interaction (Jervis, 1976; Kelley, Thibaut, 1978). Having noticed that in experimental games, players often make non-optimal decisions, the researchers are inclined to presume that players may change their perception of possible payoffs. It means that game terms are transformed in players' mind, and new decisions are made leaning on newly perceived terms (Chou et al., 2009; Kelley et al., 2003; Rusbult, Van Lange, 2003). According to Van Lange and Galluci (2003), in Interdependence Theory, individual perception of a situation can psychologically change, so a person has a subjective attitude towards the situation, and this attitude determines further behaviour of the person. Hence, although Game Theory stipulates that co-operation is rational in repeated games, but irrational in one-time (instant) games, many experimental studies have revealed that players are inclined to co-operate even in instant games, which proposes that players follow the attitude that co-operation may maximise their payoffs (Devetag, Warglien, 2008; Kiyonari et al., 2000). Nevertheless, in spite of the fact that this presumption can explain individual behaviour in experimental studies, it is difficult to develop a similar game matrix in real life (Tenbrunsel, Northcraft, 2009) because it is difficult to establish clear and objective rules of the game in the situations of the conflict of interests (Rubinstein, 1991). Real life conflicts are often misty and poorly defined, so players do not have any starting points for objective assessment of the situation. On the contrary, they think about mutual dependency between themselves and their opponents leaning on personal experience, personal perception, personal outlook and personal motives. In most cases, they even do not realize that. They simply think that they can see a conflict as it is, but this subjective attitude can be wrong, and another player can treat the same situation in a different way (Ross, Ward, 1996). Hence, with the absence of any objective game situation, it is difficult to judge whose subjective perception is right, and whose – wrong (Camerer, 1997; Devetag, Warglien, 2008; Jervis, 1976; Thompson, Hastie, 1990). According to Rubinstein (1991), a good model of Game Theory is the model that helps to get a realistic perception of a given dilemma of social life. Such model should cover accurate descriptions of different determinants and reflect how these determinants are perceived by decision-makers. The model should not necessarily include the rules about the world order, but it has to reflect people's perception of reality (Rubinstein, 1991). Therefore, although over the last 30 years social scientists have been intensively analysing how conflict and

negotiation participants define their interdependency (Kelley, Thibaut, 1978), it is also important to take into account that the analysis of conflict and negotiation participants should not necessarily provide the response to the question "What game is played?", but should help to answer the question "What game do players think they play?" (Camerer, 2003; Halevy, Phillips, 2015) The other important questions are "What is the role of motivation in personal attitudes towards gaming?" and "How do personal attitudes affect a player's behaviour?"

2.4.4.2. Patterns observed in players' perception of interdependency between their and their opponents' payoffs

According to Halevy and Phillips (2015), who introduce the Conflict Templates Model, decision-makers (players) have their own understanding about the interdependence between their and their opponents' payoffs during the process of strategic interaction. This understanding later affects players' behaviour and decisions, processes of the interaction and the outcomes of the game. This presumption was confirmed by the results of the studies carried out by many other authors (Devetag, Warglien, 2008; Kelley, Thibaut, 1978; Kreps, 1990; Rubinstein, 1991). As it was noted by Halevy and Phillips (2015), the analysis of players' attitudes towards interdependence of possible payoffs should be based on the following presumptions:

- Players' understanding about the interdependence between their and their opponents' payoffs often correspond to one of the typical situations of mixed motivation games;
- Individual motivation and attitudes of players often make them envisage the features of conflicts in particular games;
- Players' perceptions of interdependence between their and their opponents' payoffs make a significant impact on players' strategic behaviour.

The surveys conducted by Thompson and Hastie (1990) and De Dreu et al. (2000) that were aimed at the assessment of game payoffs under different courses of the games asked the respondents to fill in empty matrixes of game payoffs. The respondents were also asked to give numerical values for both personal and opponents' payoffs. The results of the survey revealed particular patterns in subjective evaluations of game payoffs. It was also found that these patterns are inherent only to four types of games: assurance game, "chick" game, difference maximiza-

tion game and Prisoner's dilemma game. Later the authors verified how high the probabilities that players' relationship may make an impact on their perception of interdependence between possible payoffs are.

The studies on relationship models and so-called taboo tradeoffs (Fiske, 1992; Fiske, Tetlock, 1997; Tetlock et al., 2000 an others) disclosed that players are not inclined to apply the presumptions of economic evaluation for the assessment of close relationship because application of purely economic criteria would violate their moral principles and social norms. On the contrary, players feel rather comfortable while applying purely economic criteria for the assessment of exchange-based relationship (e.g. negotiation, transaction making, exchange in material wealth, etc.). What is more, it is important to note that while assessing exchange-based relationship, participants of experimental studies are inclined to envisage more features of conflicts than while assessing non-exchange close relationship: the studies disclosed that the respondents easily grouped conflicts for exchange-based relationship and easily attributed them to the categories of assurance game, "chick" game, difference maximization game or Prisoner's dilemma game; on the other hand, conflicts with relatives were not easily attributed to any of the well-defined categories of games (Halevy et al., 2011). With reference on the research results, the authors make the conclusion that the above-mentioned four types of games (e.g. assurance game, "chick" game, difference maximization game or Prisoner's dilemma game) become significant in players' mind when they consider the situations of conflicts and negotiations, especially while assessing exchange-based relationship. The fact that the authors comprehensively analysed the above-mentioned four types of games discloses existence of the links between the presumptions of the Conflict Theory and the results of the scientific research. Subjective assessment of a situation is also important when interaction partners are able to control their actions (Schelling, 1980; Richards, 2001).

Assurance, "chick", difference maximization and Prisoner's dilemma games in terms of the level of a conflict

Scientific literature is rich in comprehensive studies on the above-mentioned four types of games (Camerer, 2003; Colman, 1995; Halevy et al., 2006; Kelley et al., 2003; Kelley, Thibaut, 1978; Schelling, 1980; Skyrms, 2004 and others). The main strategic and psychological features of these types of games have been reviewed in previous sections of this monograph. To get a better understanding of the impact of players' thinking patterns on their behaviour in the course of a game, it is purposeful have a look at the structure of payoffs defined for all four types of games (see Table 27).

Table 27. The structure of payoffs in assurance, "chick", difference maximization and Prisoner's dilemma games in terms of the level of a conflict

Assurance game		**Player 2**	
		C	D
Player 1	C	4,4*	1,3
	D	3,1	2,2
"Chick" game		Player 2	
		C	D
Player 1	C	3,3,	2,4
	D	4,2	1,1
Difference maximisation game		Player 2	
		C	D
Player 1	C	4,4	2,3
	D	3,2	1,1
Prisoner's dilemma game		Player 2	
		C	D
Player 1	C	3,3	1,4
	D	4,1	2,2

*Note: Numerical values in the table show the exemplary values of game payoffs expressed in benefit units; larger values show a more desirable result; the value on the left side of a cell shows the payoff of a row player while the value on the right side of a cell – the payoff of a column player.

Source: compiled by the authors with reference to Halevy et al., 2011, p. 87.

As it can be seen in Table 27, conflict may arise in assurance-type games because players may decide to defend against the pressure of competitors. Nevertheless, players in this game are motivated to co-operate if they think that competitors will also co-operate. If one player is afraid that other players may want to compete (choice D), then the best response is to compete because competition protects each of the players from the possibility to be abused. If one player expects that other players will co-operate (choice C), then the best response is to co-operate because mutual co-operation (CC) provides the opportunities to get largest payoffs (Skyrms, 2004).

In "chick"-type games, the risk of a conflict is comparatively high because mutual co-operation (CC) here is not stable – each of the players have the motives to cheat (choice D). Nevertheless, as mutual competition (DD) determines the worst possible outcomes, each of the players may choose unilateral co-operation (CD) rather than competition when other players compete (Halevy, Phillips, 2015).

In difference maximisation games, each of the players is inclined to co-operate (choice C) regardless of what strategy is chosen by competitors. Mutual co-operation (CC) ensures the best possible outcomes for all players, and it is the only possible equilibrium in this game, and vice versa – mutual competition (DD) determines the worst possible outcomes of the game.

In Prisoner's dilemma games, each of the players is inclined to compete (choice D) regardless of which strategy is chosen by other players. At the same time, players may get larger payoffs when they mutually co-operate (CC) rather than mutually compete (DD). Like in assurance-type games, in Prisoner's dilemma games players may choose competition strategy with a view to defending themselves against possible betrayal because mutual competition provides the opportunities to expect for larger payoffs than unilateral competition (CD). In addition, like in "chick"-type games, players may choose to compete in order to maximize their individual benefits, although this is not the most effective of possible decisions.

Summarising, the analysis of group thinking patterns and the scientific studies on players' perception of game outcomes in the situations of conflicts and negotiations have revealed that final outcomes of a game can be influenced not only by rational behaviour, but also by the perception of mutual relations. As it was noted by Ross and Nisbet (1991), Weick (2001), Halevy and Phillips (2015) and other researchers, players are always inclined to give some meaning to their interpersonal and intergroup relations. Hence, subjective understanding about possible conflicts or negotiations forms further patterns of thinking and behaviour in the course of a game. Psychological perception of possible outcomes cam significantly change in the course of a game, so the players who previously refused to co-operate may start doing that, and vice versa. These patterns of behaviour, determined by personal psychology, often contradict formal presumptions of Game Theory, according to which co-operation is considered as a rational decision only in repeated games, but irrational in instant games. Nevertheless, experimental studies have revealed that players often co-operate even in instant games. Another important finding is that players are inclined to envisage more features of conflicts in exchange-based relations than in close interpersonal relations. Anticipation of particular signs (e.g. sanctions) in particular situations may prompt players to stick to particular patterns of behaviour (e.g. apply different business or economic models), which oppose to ethical or moral models. Compliance to a chosen behavioural pattern ensures that the established norms, which define the boundaries and nature of personal behaviour, will be followed (March, 1994; Weber et al., 2004). These norms become peculiar instructions of behaviour for players and form both the process of the interaction and final outcomes of a game.

2.4.5. Cartel agreements

Cartel agreements (when companies agree not to compete with each other) is a serious violation of competition laws because cartel agreements on fixed prices or limited supply of particular goods/services are detrimental to consumers: some goods/products may become unavailable to particular groups of consumers (e.g. low-income consumers) and unreasonably expensive to the other groups.

Cartel agreements are made for the following reasons:

- price fixing;
- limitations of production or productivity;
- market division;
- bid price fixing in auctions (i.e. submission of an offer that is agreed in advance).

Hence, cartel activities can be described as activities when competing companies agree to fix prices of their goods or services, limit production quantities or service provision volumes, co-operate for more favourable bids while acquiring resources or share the market by dividing customers, suppliers or territories (OECD, 2016).

In order to be successful, a cartel agreement has to be kept in secret, and terms of the agreement have to be followed while making not only local or national, but also international business transactions (Berzins, Sofo, 2008). Nevertheless, even having made a cartel agreement, companies can cheat. At first glance, cheating seems unreasonable - a cartel is a group of players that (usually illegally) make a mutual agreement to coordinate their production volumes and/or prices. This is expected to maximize economic profits. If cartel agreements help to maximize profits, why to cheat? With reference to Game Theory (McCain, 2014; Dixit Skeath, 2015, etc.), establishment of a cartel agreement cannot be referred as to Pareto efficiency strategy. If participants of a cartel agreement fix high prices, they expect to earn high profits. It is possible if all of them truly co-operate and support a monopoly. However, if one of the participants has fixed extremely high prices, the other participants may want to reduce it so that they could occupy a share of the opponent's market. Lower prices determine higher profits due to higher turnover. But if several participants of a cartel agreement decide to reduce prices, this leads to reduction of profits for all of them. Hence, whatever price is fixed by a single company, other companies may see it reasonable to slightly reduce their prices. In the point where each of the companies fixes the lowest possible price, Nash equilibrium is reached. The similar situation repeats with limitations of production volumes: a company always finds it reasonable to produce slightly more than car-

tel quotas. If all other companies stick to their quotas, one of cartel participants will always find it reasonable to produce more, fulfil the needs of a larger number of consumers and occupy a larger market share. If all other companies also cheat, it is even more economic to produce more not to lag behind the competitors. Due to the reasons explicated above, even in case companies make cartel agreements, they still have motives to cheat, and many cartels fail.

Nevertheless, if a game is repeated unlimited number of times and sanctions "an eye for an eye" are imposed for violations of the cartel agreement, the terms of the cartel can remain unviolated. It means that if a company knows about the risk of counter-actions of competitors, it can be afraid to start a price war. This fear may serve as an additional motive to comply with the terms of the cartel agreement.

Although cartel agreements are considered as law violations and may result in legal liability, they are very difficult to detect. What is more, a real challenge to antitrust authorities is to decide whether a certain agreement may make positive or negative effects on the market. Cartel agreements may cover a large number of companies in particular industries, and consumers virtually have no opportunities to notice that such agreements have been made. Authorised antitrust officials help to detect cartel agreements. Co-called "mercy" programs are considered to be very efficient in this area (OECD, 2016). "Mercy" programs grant immunity or reduction of penalties for cartel participants if they agree to collaborate and to disclose the terms of the agreement. Another measure to fight cartels is deterrence of business companies from making the agreements of this type (e.g. establishment of strict penalties (fines, administrative and criminal liability, etc.) for participation in a cartel).

Nevertheless, as it was noted by Berzins and Sofo (2008), not in all cases cartel agreements are detrimental for markets or economies. Particular cartel agreements, or co-called horizontal agreements among business companies, are not always harmful. On the contrary, they may even generate some positive effects. For instance, if companies make an agreement on R&D, production or marketing activities, this agreement may help the companies to reduce costs, improve a product or a service, and all of these benefits will later be transferred to consumers. Due the above-mentioned reasons, in some countries, for example, Japan, cartel agreements are promoted as a measure of economic development (Berzins, 2006).

2.4.6. Intimidations to enter the market

Regardless of a market type (a monopolistic, oligopolistic or perfectly competitive market), companies-market incumbents always face the risk that new competitors will try to enter the market. Attempts to enter monopolistic or oligopolistic markets are determined by the prospects of huge profits. And, although the barriers to enter these markets are really high, and the chances of success – really poor, new companies usually do not stop trying because they know that success will guarantee huge profits. In perfectly competitive markets see business changes all the time.

Whatever is the type of the market, companies-market incumbents always treat the attempts of new companies to enter this market as a serious threat, i.e. a treat to lose the current position, reputation, share of profits, etc. Therefore, market incumbents are inclined to impede penetration of new companies and try to discourage them from this step.

Let's presume that a monopolistic company is facing a threat that some new company may appear in the market. Then, a multi-stage game is started: first of all, the new company decides if it really wants to enter the market. If a positive decision is made (i.e. the new company's managers decide to storm the market), then payoffs of the new company will depend on whether the incumbent is going to oppose by starting a price war. The similar situation was analysed by McCain, R. A. (2014): in his study, one company (let's call it Company X) possesses the network of 20 shops in different cities across the country (i.e. Company X acts in 20 markets). However, having envisaged the potential of economic benefits, local trading companies are also going to enter these markets one by one in the nearest future. This way, Company X will have to play 20 games with the new companies over the next few years. The intuition says that at first Company X will strongly oppose, will try to revenge and push the newcomers out of the market by starting a price war even if this war will not generate any profits. But is such game a perfect strategy? According to McCain (2014), it is not. The graphical scheme and payoffs of this game have been depicted in Figure 19.

In the first stage, a new company decides whether or not to enter the market. If it decides not to enter, Company X earns profits that is evaluated 10 on the scale from 1 to 10. This way, if neither of the new companies makes the decision to enter the market, Company X earns the profits with value 10 in all 20 markets. Hence, Company X's payoff will be equal to 10 x 20 = 200. If a new company makes the decision to enter the market, then in the second stage Company X will have to decide whether or not to fight the newcomer by starting a price war.

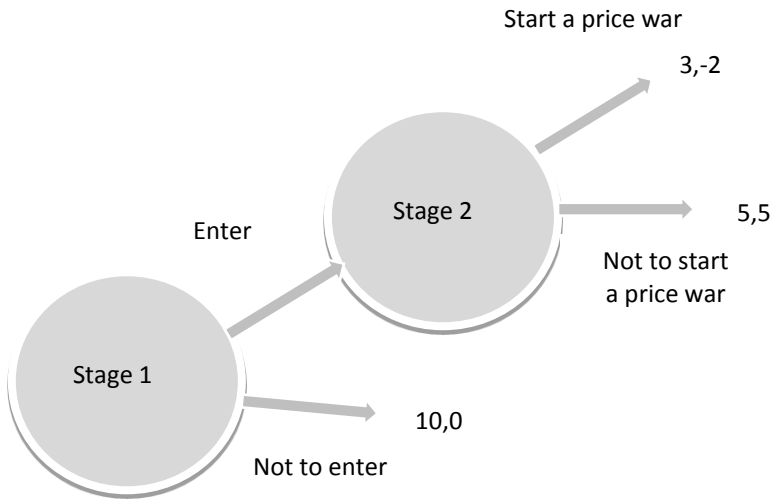

Figure 19. The example of intimidation to enter the market

Source: compiled by the authors with reference to McCain, 2014, p. 334.

If Company X decides to start a price war, the value of its profit will be equal to 3 out of 10 in this particular market, while the newcomer will bear the loss equal to -2. If Company X decides not to start any price war, it will mean that Company X is inclined to share the market with the newcomer, and profits of both companies will be equal to 5 out of 10. If the situation repeats 20 times (i.e. in all 20 markets), it will be obvious that this is a perfect game strategy for Company X. Hence, in the games of such type, equilibrium is reached when a newcomer decides to enter the market, and the incumbent does not strongly oppose to that. This result is explained by the fact that the main problem of the incumbent is that it cannot decide only to oppose because this decision is not rational for the incumbent itself. If a newcomer enters the market, the loss has already been incurred. Hence, the only rational solution for the incumbent is continue operation together with the newcomer. From the point of view of the newcomer, threats with a price war and intimidations to enter the market are only the signs of an empty gibberish. Therefore, if the newcomer properly analyses the strategies of intimidation to enter the market, it should not be afraid of any threats.

We have discussed how the game of intimidation to enter the market works under the conditions of trade. Now we will discuss how it works under the conditions of production. Let's suppose that a company-market incumbent is a monopolist that is not interested in acquisition of new equipment (i.e. current equipment is con-

sidered sufficient for profit maximization, and additional investment would require extra costs). However, if the incumbent feels the threat that a new company may try to enter the market, it may find it purposeful to increase production capacities for successful competition with the newcomer. The investment in additional capacities would reduce the incumbent's unit production costs, and larger general quantities of production would generate additional benefits from the economy of scale. Hence, intimidation to enter the market game will buy off, and increased capacities of production will be considered as a rational decision. Having faced the problem of high production capacities of a competitor, the newcomer will be likely to make the decision not to enter the market because the development of high production capacities in the initial stage of operation is a real challenge that impedes successful competition.

Summary: *intimidation to enter the market game is not rational if a company-market incumbent is going to protect its positions by starting a price war. In this case, it loses a part of potential profits, but despite that is not able to stop penetration of the newcomer. Nevertheless, intimidation to enter the market game can be rational because it can allow to reduce unit production costs and generate additional benefits from the economy of scale. Hence, the ability to create and maintain extra high production capacities usually ensures that the incumbent will retain its leading positions in the market.*

2.4.7. Mixed strategies

A player is considered to follow a pure strategy if he/she always chooses the same strategy of all possible alternatives in both each stage of the game and each separate game (for instance, a student always revises only 80 % of the material because he/she thinks that such quantity of the revised material is sufficient to get a positive evaluation). However, if a player chooses different strategies for each stage of the game or each separate game, it is considered that he/she follows a mixed strategy, which the best meets particular aims or subjective assessments (for instance, a student sometimes revises 80 %, but sometimes – 100 % of the material; a business company sometimes rushes to introduce a new product, but sometimes delays the introduction). Mixed strategies are commonly chosen when each of the players needs to assess probabilities of particular situations, i.e. they need to estimate probabilities for each of the possible outcomes and after that select the most acceptable strategy of the game. In other words, in particular situ-

ations of the conflict of interests, any systematic action of a player will be scrutinised by the opponents. Therefore, it is sometimes important to leave the opponents in obscurity and make them estimate probabilities by puzzling out personal strategies or actions.

Let's analyse the differences between pure and mixed strategies. The example of a pure strategy, which depicts competition between two TV channels, was provided by the analysis from Santa Barbara University (2011). Both TV channels compete for a larger market share, i.e. for a larger audience (total share of the audience may make 0-100 %). Each of the channels has the aim to attract as many viewers as possible because it helps to earn more revenues from commercials. The first channel (Channel 1) has an advantage against the other channel (Channel 2) because it shows the sitcoms, which always attract larger audiences than TV games. Channel 2 has an advantage against Channel 1 because it shows the TV games, which always attract larger audiences than sitcoms. The analysis of the best responsive strategy for both of the channels (i.e. revision of each cell in the game matrix) is the most reliable method to achieve Nash equilibrium (see Table 28).

Table 28. Matrix of the coordinated strategic game between two TV channels

		Channel 2	
		Sitcoms	TV games
Channel 1	Sitcoms	55%; 45%	52%, 48%
	TV games	50%, 50%	45%, 55%

Source: compiled by the authors with reference to the information of Santa Barbara University (2011).

First of all, we will select the best responsive strategy for Channel 1: if Channel 2 shows sitcoms, then the best responsive strategy for Channel 1 is also to show sitcoms because Channel 1 has an advantage against Channel 2 in this area. In this case, the payoff of Channel 1 would make 55 % against the payoff of Channel 2 which would make 45 %. However, if Channel 2 shows TV games, the best responsive strategy for Channel 1 is to show sitcoms (and again exploit the advantage possessed) and expect to achieve the payoff of 52 %. The best responsive strategies for Channel 2 are as follows: if Channel 1 shows sitcoms, Channel 2 should show TV games and expect to achieve the payoff of 48 %; if Channel 1 shows TV games, the best responsive strategy for Channel 2 is to also show TV games and expect to achieve the payoff of 55 %. It is obvious that the best solution for both of the channels is to follow a pure strategy: regardless of what is shown by the other

channel, Channel 1 should show sitcoms, while Channel 2 should show TV games. What is more, we can see that the dominant strategy for Channel 1 (i.e. the strategy which can generate higher payoffs than any other available strategy regardless of what strategy is chosen by an opponent) is to show sitcoms, while the dominant strategy for Channel 2 is to show TV games. Elimination of less rational strategies may help to find Nash equilibrium: Nash equilibrium in this game is achieved when Channel 1 shows sitcoms, and Channel 2 shows TV games.

Each ordinary game is defined by a list of strategies with particular payoffs. These are pure strategies. Nevertheless, as it was noted by McCain (2014), because all players are people, they always have other choices: they can choose strategies not by their payoffs, but by their positive probabilities. Such strategies are called mixed strategies. In other words, a mixed strategy is a choice from one or more pure strategies by particular probabilities. According to Amaldoss and Jain (2002), players are often inclined to exploit uncertainty by selecting mixed rather than pure strategies. Therefore, a game may also include the equilibrium of not only pure, but also of mixed strategies. Even in cases when the equilibrium of pure strategies is absent, a game may have the equilibrium of mixed strategies. As it was proved by John Nash, each game with two players may have the equilibrium of mixed strategies.

Some economists employ equilibriums of mixed strategies to explain sales schedules in retail. Although this rule is not applicable for all cases of sales, a large part of sales are hold by a rather easily predicted schedule, for instance, before spring season, before an autumn season, before Christmas, etc. Nevertheless, some sales seem to be hard to predict. Why do sellers sometimes want to announce unexpected sales? The answer is that if customers know about the sales in advance, they may plan their visits to the shop, i.e. they may plan to visit the shop on the days of the sale. However, a customer can also be unpredictable. If a seller knew on which days a customer is going come for shopping, he/she would not plan any sales on these days because a customer is going to come anyway, and the probability that he/she will buy something is really high. Does such explanation work with mixed strategies? In order to simplify our analysis, let's presume that the game is played by two people – a seller and a customer. Let's say that the seller follows the strategy to announce the sale on this day or on the next day, while the customer follows the strategy to visit the shop on this day or on the next day. Payoffs of both of the players have been depicted in Table 29.

Table 29. The matrix of the game between a seller and a customer for the analysis of mixed strategies

		Consumer	
		Visit the shop on this day	Visit the shop on the next day
Seller	Sales on this day	5,10	8,4
	Sales on the next day	10,5	4,8

Source: McCain, 2014, p. 191.

It is presumed that present benefits and profits are worth more than future benefits and profits. Therefore, following the principles of economics, both players appreciate present benefits rather than future benefits (this attitude is called *time preference*). Considering this presumption, let's analyse the payoffs of the game from the seller's point of view (we will mark probabilities with letter p). First of all, let's presume that the customer is going to visit the shop on this day. The values of the payoffs for both of the strategies available for the seller have been depicted in Table 30.

Table 30. Probable values of the payoffs of the strategies available for the seller

Strategy	Probable value of the payoff
Sales on this day	$5p + 8(1 - p) = 8 - 3p$
Sales on the following day	$10p + (1 - p)4 = 4 + 6p$

Source: compiled by the author with reference to McCain, 2014, p. 192.

If any of the values of the payoffs is higher, then the seller can easily fix the date of sales on the day when the customer is not going to visit the shop. Hence, the customer balances probability p so that the payoffs of both strategies would be equal. Mathematically, it can be expressed as follows:

$$8 - 3p = 4 + 6p;\ p = 4/9$$

Here, we can make the conclusion that there exists probability of 4/9 that the customer will come on this day, and probability of (1 – (4 – 9)) = 5/9 that the customer will come on the next day.

Now let's have a look at probable payoffs of the customer (see Table 31):

Table 31. Probable values of the payoffs of the strategies available for the customer

Strategy	Probable value of the payoff
To visit the shop on this day	$10q + 5(1 - q) = 5 + 5q$
To visit the shop on the next day	$4q + 8(1 - q) = 8 - 4q$

Source: compiled by the author with reference to McCain, 2014, p. 192.

Let's say that q refers to the probability that the sales will be announced on this day rather than on the next day. If any of the values of the payoffs is higher than the other, then the customer will easily choose to visit the shop on the day of the sale and get benefits from discounts. Respectively, the seller has to balance probability q so that the customers' probable payoff from the visit to the shop on this day would be equal to the probable payoff from the visit to the shop on the next day. Mathematically, it can be expressed as follows:

$$5 + 5q = 8 - 4q;\ q = 3/9 = 1/3$$

It can be concluded that there exists probability of 1/3 that the seller will announce the sales on this day, and probability of 2/3 that the sales will be announced on the next day.

Of course, this example is simplified – it covers only the analysis of two days when the seller may announce the sales. What is more, it covers only the strategies chosen by a single seller and a single customer. Equilibriums of mixed strategies can be estimated and for much more complicated games with a large number of sellers and customers, and the sales can be announced on many different days. In these situations, Game Theory allows to estimate the right balances when players choose mixed strategies.

Considering the differences between pure and mixed strategies, it should be noted that there exists games with equilibriums of both types, i.e. a game can have both the equilibrium of pure strategies and the equilibrium of mixed strategies. Let's analyse the example. Let's presume that two young boys (Tom and Paul) are so polite that they want to give priority to each other while going through the door. "Only after you, Tom", - says Paul. "Only after you, Paul", - says Tom. The door is too narrow to go both at the same time. So, the players can choose one of the two strategies: wait or go first (see Table 32).

Table 32. The example of the payoff values in the game with pure and mixed strategy equilibrium

		Paul	
		Wait	Go first
Tom	Wait	0,0	2,3
	Go first	3,2	-1,-1

Source: compiled by the authors with reference to McCain, 2014, p. 194.

If Tom and Paul went through the door at the same time, they would hit each other, and the payoffs of both of them would be equal to (-1,-1). If both of them wanted to be extremely polite and decided to wait, they would not go through the door at all (the payoff of both of them would be equal to (0,0)). If one of the players went first while the other could wait, them both of them could go through the door: the person's who would go first payoff would be equal to 3, while the person's who would go second payoff would be equal to 2. Two Nash equilibriums of pure strategies are inherent to this game (this game can be considered as the game of coordinated actions, and in this respect it is similar to other coordinated games). When only one player goes through the door while the other waits, Nash equilibrium is achieved. However, mixed strategy equilibrium can also be achieved in this game. Looking from Paul's position, let's presume that there is probability p that Tom will chose the strategy to wait. Probable values of Paul's payoffs have been depicted in Table 33.

Table 33. Probable value of Paul's payoffs in going through the door game

Strategy	Probable value of payoffs
Wait	$0p + 2(1 - p) = 2 - 2p$
Go first	$3p - (1 - p) = 4p - 1$

Source: compiled by the authors with reference to McCain, 2014, p. 194.

As the game is symmetric, the same results are obtained while evaluating Tom's payoffs. Tom has to balance probability p so that the values of Paul's payoffs would be the same:

$$2 - 2p = 4p - 1; p = 3/6 = 1/2$$

Because the game is symmetric, it can be concluded that there exists probability of ½ that one player will wait, and the same probability that one player would go

first. This result of equal probabilities reveals that, in fact, the game has two Nash equilibriums: two pure strategy equilibriums and one mixed strategy equilibrium. It is obvious that Tom's and Paul's payoffs cannot be lower than the payoffs of 2 pure strategies in Nash equilibrium. But what about mixed strategies? To answer this question, we will estimate the probable values of payoffs in the situation when the players play by the model of mixed strategies. Value *p* in Table 32 will be changed with probability ½ (see Table 34).

Table 34. Equilibrium of the probable values of Paul's payoffs in going through the door game

Strategy	Probable value of payoffs
Wait	2 – 2(1/2) = 2 – 1 = 1
Go first	3(1/2) – (1 – ½) = 1,5 – 0.5 = 1

Source: compiled by the authors with reference to McCain, 2014, p. 195.

As the game is symmetric, Tom's results would be the same as Paul's. The data in Table 34 show that Tom's and Paul's payoffs are lower in the equilibrium of mixed strategies than in the equilibrium of pure strategies (where it cannot be lower than 2). It seems reasonable considering the fact that mixed strategies cover the probabilities that both players can hit each other or not go through the door at all.

McCain (2014) also introduces another example of the social dilemma between two competing business companies. In his example, two competing companies sell the same product, and both of them can choose to advertise this product or not. If both of the companies advertise their products, their advertisement counterbalance each other. Payoffs of both companies from this game have been presented in Table 35.

Table 35. Values of the payoffs in the advertisement game between two business companies

		Company B	
		To advertise	Not to advertise
Company A	To advertise	8,8	2,10
	Not to advertise	10,2	4,4

Source: compiled by the authors with reference to McCain, 2014, p. 199.

In this game, the strategy to advertise for both companies leads to the equilibrium of the dominant strategy. The game is symmetric, so the values of payoffs are the same for both companies.

It should be noted that in the case of mixed strategies, the game should not be based on the strategy of purely consistent actions or the strategy of purely simultaneous actions. Both of these strategies can be combined (for instance, as it is done during football games). However, it should not be overlooked that transformation of the game form can change the equilibrium of the game. Let's suppose that the game is between two business companies which have to decide whether to enter a new market or not. This way, we have two players, and one of them takes the action first (see Figure 20):

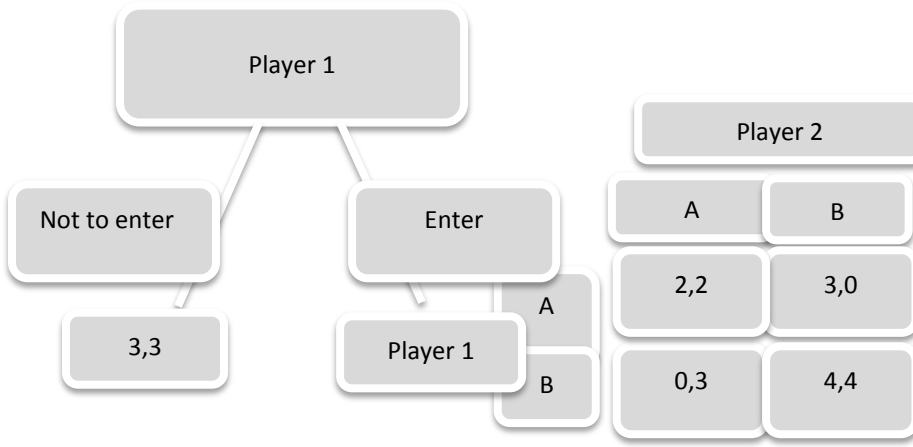

Figure 20. The example of the market entrance game between two business companies

Source: The information of Santa Barbara University, California (2011).

If the first player chooses the strategy not to enter the market, the payoffs of the first and second players will be equal to 3. But if the first player chooses to enter to market, he will further play the simultaneous strategy game with the second player. The simultaneous strategy game in the example may have three equilibriums: (A,A), (B,B) and mixed strategy equilibrium, in which both of the players choose strategy A under probability 1/3 and probable payoff 8/3. If the second player understands that the first player has decided to enter the market, he can choose to let the first player enter there: as entering the market the first player refuses payoff 3, it is likely that further he will choose strategy B. Therefore, the

second player should also choose strategy B. Hence, the probable equilibrium of this game is to enter the market and choose strategy (B,B).

The above-introduced examples disclose that ordinary games are usually started by making the list of pure strategies for each of the players; nevertheless, a pure strategy game can be unacceptable under the conditions of the conflict of interests because when selecting only pure strategies, a player can become vulnerable for predictable actions. In this case, a rational player will try to be smart and make his actions unpredictable for the opponents. As payoffs of mixed strategies are estimated under the conditions of uncertainty, the methods of probabilities and probable values are commonly employed for this purpose. Some games may have both pure and mixed strategy equilibriums. This is inherent to coordinated action games, but mixed strategies in coordinated action games are not stable.

The strategies adapted by business companies for their operation, the principles followed by these companies in different games, and the determinants of one or another strategic choice will be analysed in the empirical part of this monograph.

Summary: *a wide variety of game strategies and interactions among players provide opportunities for each of the players to find the right game in each situation of the conflict of interests under the condition that players properly analyse their and other players' positions, powers, dispositions and aims, and only after a comprehensive analysis assess the general distribution of powers. As it was noted by da Costa et al. (2009), particular anomalies in the processes of strategic planning may emerge if purely competitive or purely co-operative strategies are followed. Hence, if players want to achieve the best possible results, they are recommended to avoid strict and pure strategies. Instead of sticking to strict strategies, they should try to analyse many different models of the conflict of interests.*

2.5. Experimental research in game situations and deviations from the principle of rationality

Classical Game Theory, which covers different situations of the conflicts of interests among different subjects, is based on the presumption that players think rationally. It also includes the analysis quantitative models and hypothetical examples. Of course, we need to agree that hypothetical simplification of a situation often contributes to easier understanding of the basic aspects of conflicts and cooperation (Myerson, 2013), in particular, when the situation is complicated, and it is difficult to find a mathematically optimal solution. However, the question then arises as to whether players always play so rationally and reasonably that mathematical equilibrium of the game is always possible.

Scientists try to answer this question by conducting experimental research in different types of games. Experimental research in human behaviour was started in 1879, when Wilhelm Wundt established the first laboratory of psychological research in Leipzig (Simon, 1990). In the 20th century, experimental research in human behaviour was started to be employed for the analysis of human behaviour in different situations. The main elements of experimental research are as follows:

- an independent variable – this is an element of an experiment that is purposefully changed during the experiment to find out what impact it makes on the behaviour of the person observed;
- a dependent variable – this is an observed factor or behaviour that can be differently influenced by the changes in an independent variable;
- experimental conditions – these are conditions under which the observed people are influenced by an independent variable;
- control conditions – these are conditions which are identical to experimental conditions, but under these conditions the observed people are not influenced by an independent variable.

Experimental studies are based on so-called *assumption of uniformity*, which means that if natural laws are the same, the patterns revealed by an experiment could be inherent to similar situations, only in different places and at different time. In other words, the patterns that are observed while conducting scientific-experimental studies on human behaviour, can be observed in other areas of life. The same presumption is followed while conducting experimental studies in the area of different games, i.e. it is presumed that the patterns of players' behaviour that are observed during an experiment can be typical of other forms of human interaction. Experimental studies on various games incorporate the models from

other social sciences such as psychology or experimental economics. Framing is one of the psychological models which is increasingly employed for experimental research. With reference to this model, human decisions can depend on how a question is raised, i.e. human decision much depends on formulation of a question. For instance, would you buy a product which is lower in fats by 95 % or a product which contains 5 % of fats? Of course, both of these formulations indicate the same quantity of fats in the product, but have you even seen an advertisement which say that a product contains 5 % of fats?

The impact of formulation of a question/a statement on human decision was analysed by psychology scientists Amos Tversky and Daniel Kahneman (1985). Although their experiment was indirectly related to Game Theory, it covered the analysis of human risk perception, which is closely linked to the conditions of many games. The authors analysed the participants' reaction to the treatment of a hypothetical disease: the participants were informed that the epidemics of unidentified tropical disease may cause 600 deaths if no preventive measures are employed. The participants could choose one of the interrelated, but incompatible preventive measures. One groups of the participants was told that:

- if they select program A, 200 lives will be saved;
- if they select program B, the probability that 600 lives will be saved is equal to 1/3, and the probability that nobody will be saves is equal to 2/3.
- The other group of the participants was told that:
- if they select program A, 400 people will die;
- if they select program B, the probability that nobody will die is equal to 1/3, and the probability that 600 people will die is equal to 2/3.

In fact, the formulations presented to both of the groups mean the same from mathematical point of view, but the first formulation highlights the statement that program A will definitely save 200 people, while the second formulation says that 400 people will surely die. The reaction of the participants to the formulations was different: those who were told that program A will save 200 people were inclined to select this program (28- 72 % of the participants), while those who were told that selection of program A will cause the death of 400 people were inclined to select program B (22 – 78 % of the participants). It is obvious that formulation of conditions of the situation had the substantial impact on the participants' decision.

Experimental research in game situations with employment of the models from psychology and experimental economics is comparatively new. The experiment of the modified Prisoner's dilemma was practically the first attempt to adjust the

model of human behaviour analysis for the research in a game situation. During this experiment, which was conducted in January of 1950, scientists Merril Flood and Melvin Dresher from "RAND" corporation researched the behaviour of Armen Alchian, the professor in economics, representing "UCLA tradition", and John Williams, the manager of the department of mathematics, representing "RAND" corporation. The game itself was developed by the modified structure of Prisoner's dilemma. The matrix of the payoffs of this game have been presented in Table 36.

Table 36. The matrix of the payoffs for the experimental Prisoner's dilemma game

		John Williams (player 2)	
		To co-operate	Not to co-operate
Armen Alchian (player 1)	To co-operate	(1/2,1)	(-1,2)
	Not to co-operate	(1,-1)	(0,1/2)

Source: McCain, 2014, p. 448.

As it can be seen in Table 36, both scientists could choose one of two strategies: to co-operate or not to co-operate. The game was asymmetric, i.e. the second player was more successful than the first player in three out of four strategic combinations (regardless of whether the players decided to co-operate and not to co-operate). Here lied the complexity of the experiment. Armen Alchian and John Williams played 100 successive times. The information about their strategies and the notes of their comments were accumulated. Both players started the game with different expectations, and in a particular sense, differences in expectations remained till the end of the game: Armen Alchian expected that John Williams will not co-operate, whereas John Williams tried to select co-operation strategy at the beginning of the game, but later, when he had to respond to the opponent's strategy not to co-operate, he started to select non-cooperation strategy in the further stages of the game. Armen Alchian could not understand such strategic behaviour of his opponent and started to think that the opponent selected mixed strategy (for this reason, John Williams called the opponent fool in his notes). Finally, Armen Alchian understood that the opponent was proposing co-operation game. Nevertheless, having become a victim of the asymmetric game, he thought that John Williams should take some steps to balance the payoffs and to allow him, Alchian, not to co-operate at the current stage of the game. Actually, the players co-operated only in stages 83–98. When the game was coming to an end, Armen Alchian began to fear that further co-operation is impossible because the game

will not be repeated. Therefore, he decided not to co-operate any longer. In stage 100, both players did not co-operate. William Poundstone (1992) later wrote: "It seemed that he was still thinking that the opponent was following the mixed strategy" (p. 107). From the very beginning of the game, Armen Alchian stuck to his strategy, and only later he started to respond to his opponent's strategy whereas John Williams initially observed the behaviour of the opponent, assessed the probabilities, always responded to the opponent's behaviour and treated the opponent's choice not to co-operate as a selfish reluctance to share the benefits, which could have been gained from co-operation. According to McCain (2014), if the game had contained any fixed agreement, both players could stick to a joint mixed strategy.

After Flood and Drexler's (1950) experiment, experimental game theory has further been improved for half of the century: the methods for experiments were borrowed from the areas of psychology and experimental economics, and the rules of experiments were defined considering the specificity of the situation, when the results depended on the interrelationship between the strategies that were analysed. What is more, the rules, which explained how to prevent data incompatibility in risk experiments, were developed. The results of the original Flood and Drexler's (1950) experiment were confirmed by further experimental research, which revealed that the subjects who participated in the experiments not always selected dominant strategy equilibrium, but often stuck to co-operation strategies. Considering the findings that in practical situations, players not always behave in the way, in which they should behave from the theoretical point of view (i.e. players do not select a dominant strategy equilibrium), the following two experimentally-substantiated conclusions about Prisoner's dilemma games can be made (Botelho et al., 2009; McCain, 2014):

- In practical situations, players are not as rational as they are considered to be by initial presumption of Game Theory; they do not select a dominant strategy equilibrium for the reason that they cannot fully understand the game;
- In practical situations, players are able to solve social dilemmas better than by initial presumptions Game Theory, probably because they not always substantiate their actions only with personal benefits or selfish motives;

The discussions about these new experimental presumptions of Prisoner's dilemma games often stress that only one of the above-mentioned presumptions is right, i.e. in practical situations, players either do not understand the game and do not select a dominant strategy equilibrium, or are able to solve social dilemmas without the aim to gain personal benefits.

Cooper et al. (1990) researched the behaviour of business students. The students, who agreed to participate in the research, were randomly paired and asked to play anonymous games via computer networks without seeing each other. In order to avoid complicated structures of repeated games, the researchers made the games instant. Possible payoffs were balanced with risk degrees. The results of the research disclosed that the majority of the players were able to achieve Nash equilibrium, and only a few selected co-operative strategies, although they were available by the conditions of the game. Hence, the results of this research confirm the results of many previous studies, which show that Nash equilibrium as well as a dominant strategy equilibrium can be achieved when a game is comparatively simple and does not contain any conflict between Nash and co-operative strategies. It means that if a player only seeks personal benefits, he is likely to choose the strategy which can lead to the best possible results whether it is Nash equilibrium or co-operative strategy. However, if a game contains the conflict between Nash and co-operative strategies, decision making becomes more complicated, and there are no guarantees that a player will choose a mathematically rational decision.

With a view to showing how selfless motives may change mathematically rational results of a game, further in our monograph, we will analyse ***ultimatum-type*** and ***"centipede"*** games.

During the ultimatum-type game, described by McCain (2014), the amount of 50 U.S dollars had to be shared between two players. One player, who played the role of an offeror, had to offer another player, who played the role of a respondent, the share the money. Responding to different offers, the respondent could agree or disagree with them, i.e. he could simply say "Yes" or "No". No negotiation between the players was possible; the game was not repeated. Following the conditions of the game, if the offeror and the respondent had agreed on how to share the money, they could have left the money for themselves. However, if they had not agreed, neither of the players could have got anything. Of course, the offeror could offer the respondent one dollar by expecting maximal benefits (49 dollars) for himself. But would the respondent agree with that? The results of the experiment revealed that the respondents usually declined the amounts smaller than 30 % of the initial value of the offer. Hence, the respondents did not behave altruistically because an altruist would have never rejected any offer, even for zero. Knowing that the risk that the respondent will reject low-value offers is high, the offerors usually offered much more than the minimal amount of one dollar. This way they were trying to balance their maximal possible benefit and the probability of the offer rejection. The offers to divide the amount in half were rather frequent. McCain (2014) explains this tendency as a priority to the principle of fairness, i.e. the majority of the players thought that division of the amount in half was a simp-

ly fair solution. Another explanation, which can be found in many modem scientific studies (McCabe et al., 1998; Uhl-Bien, Maslyn, 2003; Fong, 2007; Mitchell, Ambrose, 2007 and others), is *the hypothesis of reciprocity*. With reference to this hypothesis, players can refuse selfish interests to gain the perceived benefits or to respond to an opponent's disrespect. For example, if a respondent is offered 5 dollars, he can treat this offer as disrespect because an offeror wants to get 90 % of the value of the initial amount. Then he can refuse the benefits of 5 dollars and reject the offer. On the other hand, a player can refuse personal benefits when he treats an opponent's behaviour as respectful. Such tendency is known as *negative reciprocity*. Hence, the results of an ultimatum-type game can be closely linked not only to the mathematical equilibrium of the game, but also to different aspects of reciprocity.

Now, let's take a look at so-called "centipede" games. The example of the simplest "centipede" game has been presented in Figure 21.

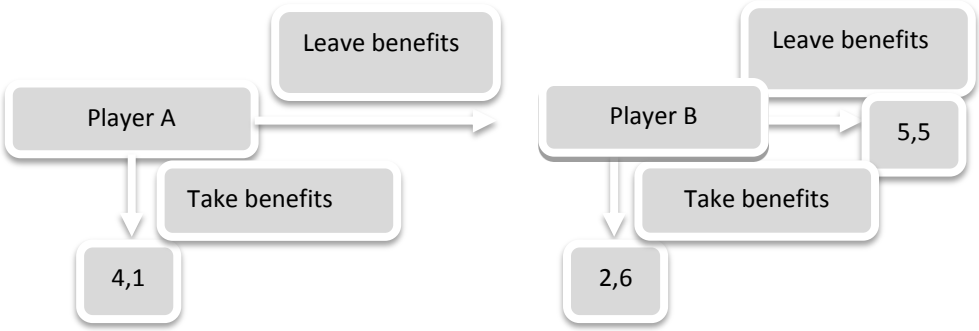

Figure 21. The example of the "centipede" type game

Source: compiled by the authors with reference to McCain, 2014, p. 459.

Let's presume that the game is started from the possible payoff, the value of which is equal to 5 benefit units (i.e. the value of the payoff is equal to 5). Player A can take 4 benefit units for himself and leave only 1 benefit unit for player B, or he can decide to transfer all the benefits to player B. Having received all possible benefits, player B can simply take it or leave in the game. In the latter case, the possible benefits from the game are increasing: if the benefit is left in the game for the second time, it increases to 10, and both players can share it in half (5 benefit units for each). In accordance with the presumption of the perfect equilibrium in Game Theory, the players should consider only their personal interests and take the benefits in the first stage of the game. However, the results of the experimental studies show that players in real life are inclined to leave the benefits in the game so that they would increase and later it would be possible to divide them in half. It

is not common to grab the benefits in the initial stage of the game. Even when a "centipede" game consists of many stages ("centipede" games can consist of more than 100 stages), some players take their benefits in later stages of the game. Some scientists (Charness, 2002; Mitchell, Ambrose, 2007 and others) explain such tendencies leaning on the same hypothesis of reciprocity, in particular, on the positive aspects of reciprocity: player B clearly understands that player A can take the largest part of initial benefits, so if player A decides to leave the benefits in the game, player B treats this act as respectful and is inclined to retaliate. This way, if both players are motivated by positive reciprocity, the benefits are shared in half at the end of the game.

On balance, the results of experimental research have disclosed that games in real life often do not meet the theoretical presumptions of Game Theory. In ultimatum-type games, the manifestations of negative reciprocity can often be observed, while in "centipede"-type games players are often motivated by positive reciprocity.

Nevertheless, as it was noted by McCain (2014), we cannot make a clear distinction between positive and negative reciprocity, and both of these types of interaction can influence each other. Let's study a modified "centipede" game (see Figure 22).

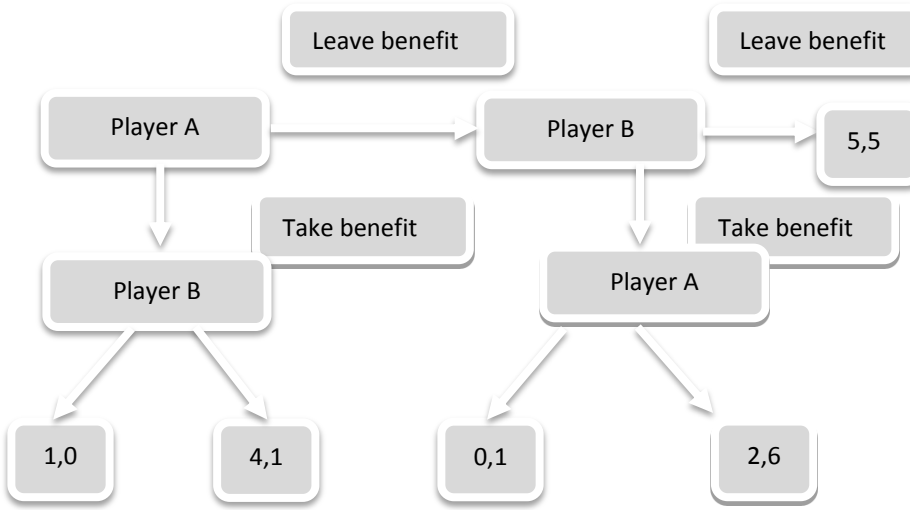

Figure 22. The example of the modified "centipede" type game

Source: compiled by the authors with reference to McCain, 2014, p. 460.

The modified "centipede" game includes the responsive actions of one player to the actions of another player. If player A from the beginning of the game takes the benefits, player B has the opportunity to retaliate by choosing the strategy, which is depicted on the left side of Figure 22, or he can decide not to retaliate and follow the strategy, which is depicted on the right side of Figure 22. Retaliation only worsens the situation of both players: a part of the possible benefits is wasted for retaliation against the opponent. Hence, experimental research has revealed that retaliation can never be considered as the best strategy. Therefore, the players who play in real life try to prevent negative reciprocity, which prompts them to leave the benefits in the game.

While applying the principles of Game Theory, economists presume that players are rational and seek personal benefits. However, the study conducted by George Akerlof (1982) disclosed that reciprocity is extremely important, and this tendency can be observed not only in economic business situations, but also in labour relations. Akerlof (1982) started his study from the notion that employers sometimes pay their employees more than the average wages for similar works in the labour market. This way, the employees would have what to lose if they decided to quit. This understanding increases employees' productivity: if they have what to lose, they always work more efficiently and with higher motivations, which, in turn, raises the general efficiency and profits of the company. The wages higher than the average market wages for similar jobs are called *efficiency wages*. Akerlof's (1982) study disclosed that the employees, who get efficiency wages, do more than the minimal volumes of work, which would need to be done not to be caught faking off. Akerlof (1982) explains this tendency stating that this is the way for employees to respond to generosity of their employer. Such notion forms positive reciprocity between both parties. The author also draws the parallel between the current trends and the lifestyles of ancient cultures, in which reciprocity was created by giving different presents to each other. Hence, while analysing the reciprocity between employees and employers, higher than the average market wages are treated as a present, and an employee wants to sacrifice a part of his/her selfless interests (he/she could work with minimal effort) in exchange for the perceived benefits. On the contrary, employees work only with minimal effort if they want to revenge the employer who pays lower that the average market wages.

Level *k:* when it is worth to follow the principle of rationality

Game Theory is based not only on the principle of rationality, but also on the general knowledge about rationality. It means that a player should not expect to outwit his/her opponents: if one player knows that other players are rational in the same game, then it is unreasonable to try to outwit the opponents. Nevertheless, as it was noted by McCain (2014), this presumption is comparatively theoretical

and can be applicable only while analysing the games in which all participants have some experience. In practice, we can often observe the cases when players choose their strategies without having any experience or relevant information. In such games, application of the principle of rationality is a bad idea at least for the following reasons:

- The studies show that real human rationality is limited. Mathematical solutions in rationality-based games can be rather complicated and exceed the abilities of ordinary people who do not have any experience or appropriate training in this area.
- There is evidence showing that people (in particular, players) often try to outwit each other. The attempts to outwit an opponent are reasonable if a player knows that rationality of the opponent is limited, i.e. that the opponent is not as rational as it is considered. Therefore, some players behave more rationally than others.

The above-mentioned presumptions make the foundations of the type of strategic thinking, called level *k*. The features inherent to level *k* games are as follows:

- Level 0: in this level, players choose strategies without any intensive thinking, often randomly;
- Level 1: in this level, players choose what best response they can give to their opponents' decisions in level 0;
- Level *k*: when $k > 0$, a players choose what best response they can give to their opponents' decisions in level $k - 1$.
- Level *k* games can be played by two categories of players:
- balance players, i.e. the players who simply do not want to achieve Nash equilibrium;
- refined players, i.e. the players who try to assess characteristics of the opponents, choose the best possible response and gain maximum benefits.

As the example of a level *k* game, McCain (2014) introduces the game with two large shopping chains. Let's call them shopping chain M and shopping chain I. The managers of both shopping chains have to select the best locations for their shops. The matrix of the payoffs of this game has been presented in Table 37.

Table 37. The example of a level *k* type game

		Shopping chain I			
		Outskirts	City centre	Eastern part of the city	Western part of the city
Shopping chain M	Outskirts	30,40	50,95	55,95	55,120
	City centre	115,40	100,100	130,85	120,95
	Eastern part of the city	125,45	95,65	60,40	115,120
	Western part of the city	105,50	75,75	95,95	35,55

Source: compiled by the authors with reference to McCain, 2014, p. 463.

The unique Nash equilibrium for both of the players is to establish their shops in the city centre. At level 0, the players choose from four alternatives, and the probability that one of the four strategies will be selected is equal to ¼. Let's suppose that shopping chain I is a level 0 player. Then, possible benefits of shopping chain M are estimated by employing the mathematical expressions presented in Table 38.

Table 38. Possible benefits of shopping chain M if shopping chain I is treated as a level 0 player

Strategy	Possible benefits (payoffs)	Total
Outskirts	30/4 +50/4 + 55/4 + 55/4	**47,5**
City centre	115/4 + 100/4 + 130/4 + 120/4	**116,25**
Eastern part of the city	1125/4 + 95/4 + 60/4 + 115/4	**98,75**
Western part of the city	105/4 + 75/4 + 95/4 + 35/4	**77,5**

Source: compiled by the authors with reference to McCain, 2014, p. 464.

As it can be seen from Table 38, for shopping chain M, the best response to shopping chain M's strategy is selection of the city centre with the possible payoff equal to 116,25 benefit units. Now let's suppose that shopping chain I's managers think that shopping chain M's managers are level 0 players. Shopping chain I's possible benefits from the game have been presented in Table 39.

Table 39. Possible benefits of shopping chain I if shopping chain M is treated as a level 0 player

Strategy	Possible benefits (payoffs)	Total
Outskirts	40/4 + 155/4 + 125/4 + 105/4	**96,25**
City centre	95/4 + 100/4 + 65/4 + 75/4	**83,75**
Eastern part of the city	95/4 + 85/4 + 40/4 + 95/4	**78,75**
Western part of the city	120/4 + 95/4 + 120/4 + 55/4	**97,5**

Source: compiled by the authors with reference to McCain, 2014, p. 464.

As it can be seen in Table 39, the best responsive strategy for shopping chain I is to establish the shop in the western part of the city, and the payoff of this strategy is equal to 97,5 benefit units. Hence, if shopping chain M was a level 0 player, its managers would choose the city centre, but if shopping chain I was a level 0 player, its managers would choose to establish the shop in the western part of the city. And what would happen if both shopping chains were level 2 players? Then, for shopping chain M, the best responsive strategy to shopping chain M's level 1 strategy would be to select the city centre. The best responsive strategy for shopping chain I would also be to select the city centre. In level 3, both shopping centres would choose the city centre, and they would do the same at all further levels of the game. As Nash equilibrium in this game is to choose the city centre for both of the players, it can be concluded that if both of the players play at least level 2 game, they will reach Nash equilibrium.

In accordance with level *k* theory, experimental studies often cover the situations when players play level 1 or level 2 games, while the games when players play at level 0 are relatively rare. However, as it was noted by McCain (2014), while assessing particular situations of games, it should not be overlooked that some players model their strategies by the principles of level 0. According to the author, not all games involve such proficient players who are able to make accurate estimations of benefits and reach Nash equilibrium. Hence, the main problem, which arises while analysing level *k* games, is to foresee how level 0 players will behave (if level 0 players participate in the game). In some games, it is difficult to foresee that a player can choose a random strategy. But some strategies have particular features, which seem attractive to players. Therefore, they are selected without any long considerations. Attractive and exceptional features of particular strategies are known as the strategies with *cognitive salience* (Lovaglia et al., 2005; van Dick et al., 2009; van Hattem et al., 2013; Fonti et al., 2015 and others). Having in mind the impact of cognitive salience, we can raise the question: will an amateur player choose a random strategy or a strategy with cognitive salience? To answer

this question, McCain (2014) presents the example of a *greed game*. In this game, players P and Q choose between four strategies: S1, S2, S3 and S4. The matrix of the payoffs of this game has been presented in Table 40.

Table 40. The example of the greed game

		Player Q			
		S1	S2	S3	S4
Player P	S1	0,0	0,400	0,500	1000,0
	S2	400,0	300,300	0,0	400,0
	S3	500,0	0,0	100,100	0,0
	S4	0,1000	0,400	0,0	0,0

Source: compiled by the authors with reference to McCain, 2014, p. 467.

As it can be seen in Table 40, the game has two Nash equilibriums, which are available to players when they choose strategy pairs (2,2) and (3,3). First of all, let's suppose that a level 0 player randomly chooses one of the four strategies. Then, level 1 player has to assess his possible benefits, mathematical estimations of which have been presented in Table 41.

Table 41. Possible benefits from the greed game played against a level 0 player

Strategy	Possible benefits (payoffs)	Total
S1	0/4 + 0/4 + 0/4 + 1000/4	**250**
S2	400/4 + 300/4 + 0/4 + 400/4	**275**
S3	500/4 + 0/4 + 100/4 + 0/4	**150**
S4	0/4 + 0/4 + 0/4 + 0/4	**0**

Source: compiled by the authors with reference to McCain, 2014, p. 464.

As it can be seen in Table 41, the largest possible payoff is obtained when choosing strategy S2, so a player who has to play against a level 0 player should choose this strategy. The same should be repeated in the second, third and any further stages of the game. Nevertheless, the payoff equal to 1000 benefit units is twice as high for strategy pairs (1,4) and (4,1) that for any other pairs. Therefore, players can treat it a as jackpot. This feature can attract the attention of a level 0 player, and if greed wins, the player will choose strategy S1 rather than a random strategy. Then, the best response for a level 1 player is to choose strategy S3 and reach Nash equilibrium with strategy pair (3,3). The example illustrates that a greed

game may bring different results which depend on what strategy – greed or random – is followed by a level 0 player. Although in both cases Nash equilibrium can be achieved, in the first case it would be reached with strategy pair 2,2, while in the second case it would be reached with strategy pair 3,3. Hence, on one hand, level *k* theory can be helpful when it is possible to identify a level 0 model, but on the other hand, if identification of a level 0 model is impossible, players should rely on the analysis of facts. Anyway, the biggest advantage of level *k* theory is that it reveals limited rationality of players and shows that a strategy chosen by one player makes a direct impact on strategic reciprocity between the players.

On balance, previous experimental research disclosed significant differences between theoretical presumptions of Game Theory and experimental results obtained while analysing different types of games. The results of experimental studies often reveal particular uncertainties, which very often emerge while analysing non-cooperative games, and the results of these studies oppose to the theory of human strategic behaviour.

Summary: *Real human rationality is bounded rationality, which refers to a mathematically irrational strategy of attempts and mistakes. This strategy helps players achieve the results which are close to mathematical equilibriums. Nevertheless, in particular types of games (e.g. in the case of Prisoner's dilemma) the strategy of "learning from mistakes" can cause reverse effects (for instance, as it could be seen in Flood and Drexler's (1950) experiment, in which the opportunities of co-operation between two scientists - Armen Alchian and John Williams – were analysed).*
Different players may want to solve a social dilemma for different reasons and driven by different motives. Different motivation determines the differences in players' aims and strategies. As it was noted by McCain (2014), each game contains more than one solution. Players can choose one or another strategy simply for different formulation or because one or another strategy possesses cognitive salience that attracts the attention, especially in level 0 games. It was found (Rapoport, Chammah, 1995; Angier, 2002; McCain, 2014) that women and men usually choose different strategies, so the results of the experiments with women are not necessarily consistent with the results of the experiments with men or representatives of both genders. The results of the studies conducted by Rapoport and Chammah (1995) revealed that women are less inclined to co-operate than men. However, these results were not confirmed by any further studies. On the contrary, Angier's (2002) study disclosed that women are more inclined to seek co-operation-based results. With absence of the consistent results, no reliable conclusions about the inclination of both genders to co-operate can be made. In any case, scientists agree that representatives of different genders may choose different game strategies, which, in turn, may determine different results of the games with similar conditions. Real human behaviour is very complicated. Therefore, at least from practical point of view, the probability that a part of decisions will be made at random is very high.

3. THE METHODOLOGY OF APPLICATION OF THE THEORY OF GAME STRATEGY IN COMPETITIVE MARKETS

3.1. The Methodology of Expert Evaluation

The methodology of expert evaluation is one of the most widely spread insight methods. Scientists apply expert evaluation method to various industries (Baležentis, Žalimaitė, 2011). According to Rudzkienė, Burinskienė (2007), expert evaluation method can be understood as a summary of the experts` group opinion, to which specialists` expertise, experience and intuition are adapted. The essence of expert evaluation method is that experts perform the problem`s analysis, quantifying opinions and crafting results, and the summarized experts` opinion is presented as the solution to the problem.

Expert evaluation method is a procedure that allows to coordinate different experts` opinions and to form a joint decision. Expert evaluation is mainly applied to study certain problem, process or phenomenon, which requires specialized knowledge and skills. The study results are presented in reasoned conclusions or recommendations (Rudzkienė, Burinskienė, 2007).

An expert (lat. *expertus* - experienced) is generally regarded as a specialist with expertise and experience in a particular field. The expert evaluation`s goal – is to organize, code, give structural process and interpretation to the received knowledge, applying logical and mathematical methods. To make a qualified decision to the problem, it is very important to consider the professional`s opinion, that in expert research methodology is called expert`s expertise. Variety of methods are developed and applied to receive experts` evaluation (Rudzkienė, Burinskienė, 2007). In practice, there are several ways of performing expert evaluation. In one case an expert works individually, he/she does not even know that he/she is regarded as an expert. This method helps to avoid the impact of outstanding authorities` opinion. Otherwise, experts gather together to discuss the problem. They evaluate the expressed considerations and reject the false ones. According to Baležentis, Žalimaitė (2011), expert evaluations require special expert knowledge and experience, which has only a small number of specialists.

According to Department of Statistics to the Government of the Republic of Lithuania, at the beginning of 2016 in the country operated 79 840 business companies. The business market is divided by classical macroeconomic theories into the main types of market competition, i.e. monopoly, oligopoly and imperfect competitive market. Duopoly is less popular, and at the theoretical level there exists only a perfect competitive market.

In order to conduct a comparative market analysis and verify the patterns of application of the principles of Game Theory in business, the individual expert evaluation method – survey questionnaires – was selected.

According to Makridakis et al. (1998), while employing this method, it is appropriate to question from 10 to 100 experts, depending on the purposes of the study and considering the experts` competence in the researched area. Meanwhile, according to Augustinaitis et al. (2009), in order to maintain the accuracy and reliability of expert evaluation, it is recommended to include at least 5 experts in the group.

The survey of the experts was conducted both directly (personally interviewed) and indirectly (by phone, e-mail) by a questionnaire prepared in advance (see Appendix 1). Scientific literature (Augustinaitis et. al., 2009) especially emphasized the importance of experts` expertise, along with creativity, standpoint of expertise, thinking flexibility, reliability, self-criticism and so forth. Therefore, during the study the emphasis was made not on the survey scope, but on the experts` expertise, their long-time experience in current activities, their knowledge of business environment and its problems. Abiding by the mentioned criteria, 23 people were included in the expert group.

According to Augustinaitis et al. (2009), in determining the reasonable amount of experts, it is necessarily to follow the methodological tools, developed in the classical test theory, which claims that reliability of decisions and the number of decision-makers (in this case, experts) are related by the rapidly receding linear relationship (see Figure 23).

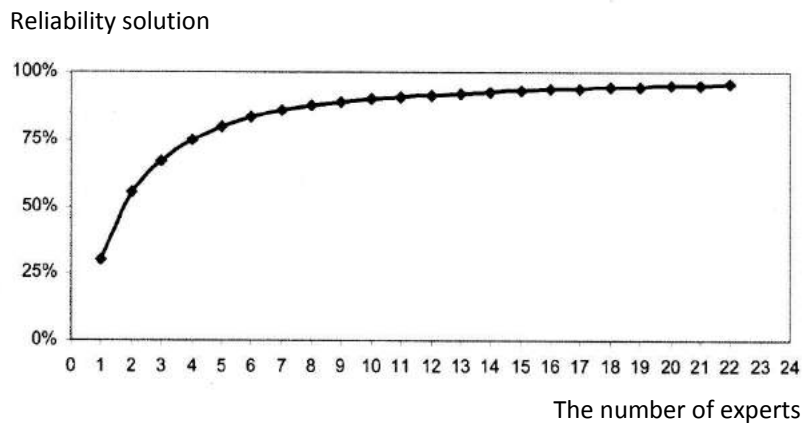

Figure 23. The impact of the number of experts on reliability of evaluation

Source: Augustinaitis et al., 2009.

Augustinatis et al. (2009) in his study mentions Libby, Blashfield (1978), who proved that the experts` evaluation module with the same weight of a small group decision and evaluation accuracy does not yield to a large group of experts` decisions and evaluation accuracy, but the evaluation accuracy of the group of three experts sometimes significantly surpasses one or two experts` evaluation accuracy. A further increase in the experts group accumulates slightly the accuracy and becomes the largest in the group of 5-9 experts. In the cases, when the group of 5–9 experts is not sufficient for the evaluation accuracy, it is appropriate to increase not at a group of experts, bet the experts` expertise.

The analysis and interpretation of the results. The experts' questionnaire (Appendix 1) consists of 2 parts. The first part aims to get general information about an expert, i.e. his/her business scope, management experience in the company, and to which market type the expert's company belongs. The second part of the questionnaire is dedicated to the application of the game theory in business decisions in order to establish: the game theory concept (the questionnaire's 1 question), the positive effect of the game theory`s strategy (questionnaire`s 2 question), the game theory`s application rate in business (the questionnaire`s 3 question), the game theory`s principles and tactics in the business (the questionnaire`s 4 question), the pricing strategy`s choice through the prism of the game theory (the questionnaire`s 11 question), the most applicable game theory`s strategy and gaming type in the company (questionnaire`s 12 and 14 questions). The selected experts for this study were to evaluate questions 4, 11 and 12 on the scale from 1 to 5 (numerical value 1 - "I totally disagree / it is totally irrelevant"; numerical value 5 - "I strongly agree / it is absolutely important"). Depending on the consent`s strength, the experts were able to choose the intermediate numerical values 2, 3 or 4.

The data collected during the expert evaluation were processed with the statistical program SPSS (*Statistical Package for Social Sciences*) and Microsoft Excel software package. The estimated numerical values were listed in a special table (see Table 42).

In Table 42, $\mathbf{V_{jn}}$ shows what level of importance was attributed by the *j*-th expert to the *n*-th statement in the questionnaire. The data in the Table is structured; the sum $\mathbf{V_i}$ to statement *i* has been estimated; the sum`s $\mathbf{S_i}$ value to statement *i* refers to $\bar{s}$; Kendall`s coefficient of concordance (W), which reflects every statements` importance and concordance of the experts` opinions, has been determined. Kendall`s coefficient of concordance may vary in the range of $0 \leq W \leq 1$. The ratio closer to 1 indicates that more opinions of the experts coincide. If $W \leq 0.6$, it is considered that the expert evaluation results are unreliable.

Table 42. The matrix of the results of expert evaluation

Experts	Factors (V)					
	1	2	...	i	...	N
1	V_{11}	V_{12}	...	V_{1i}	...	V_{1n}
2	V_{21}	V_{22}	...	V_{2i}	...	V_{2n}
...	...	...	...	...	...	...
J	V_{j1}	V_{j2}	...	V_{ji}	...	V_{jn}
...	...	...	...	...	...	...
M	V_{m1}	V_{m2}	...	V_{mi}	...	V_{mn}
Sum						
Kendall's coefficient of concordance, *W*						
p-value						
Indication frequency						

The reliability of expert evaluation depends on the expert`s individual level of knowledge and the number of members in the group. Making an assumption that experts are sufficiently precise measurers, it can be stated that the increase in the number of experts also increases reliability of survey results. The degree of expert expertise is valued in the quantitative way by the expertise coefficient. Expertise – the expert`s qualification degree in a particular field of knowledge.

While presenting the results of the expert evaluation, the attention should be paid to interpretation of *Cronbach's alpha* coefficient. *Cronbach alpha* coefficient shows whether the questionnaire accurately reflects the researched object. Some scientists, for example, Nunnally and Bernstein (1994) argue that *Cronbach alpha* coefficient should be not lower than 0.7, while other scientists, for example, Malhotra and Birks (2003) state that the critical threshold of a questionnaire's reliability is 0.6. The choice of the critical threshold is a subjective matter, and while choosing this limit, the specific nature of the study and qualitative aspects may be taken into consideration. For this empirical study, we selected 0.7 as the lowest value of *Cronbach alpha* coefficient. For hypothesis testing, we selected 0.05 as the level of significance. Indicator differences were considered statistically significant if $p < 0.05$.

Confirmation or denial of the hypothesis and development of the conclusions are the final stage of the empirical study, the success of which depends on how well the previous steps were performed. It is obvious that errors in calculations or im-

proper conduct of empirical studies can lead to false hypothesis testing results, and improperly formulated hypotheses can lead to irrelevance of conclusions.

It should be noted that after determination of the basic strategies of Game Theory for different markets, the patterns of application of the principles of Game Theory can be developed by individual structures of market competition.

3.2. The typologies and features of market competition

The idea of a business establisher of what product to make or what service to provide determines the circle of customers, suppliers and competitors, i.e. forms different markets. Considering the features of particular markets, economists divide them into: **monopolies, oligopolies, monopolistic competition markets** and **perfectly competitive markets**. Separation of different markets is sometimes a challenging task because it is difficult to understand where one market ends and another market begins. Therefore, the best solution in this case is consideration of specific features that are inherent to a particular market.

It is often stated that free market leads to an increase in monopolistic powers, and monopolies have the power to decide whether it is worth increasing the prices of their products or services. The increase in monopolistic powers determines high economic inefficiency, reduces productivity and lessens the average standards of living. Hence, governments should aim at resurrection of competition, for example, by employing antitrust laws. Unfortunately, such categorical stances are not often observed in free market economies.

3.2.1. Monopoly

Monopoly is not a business, but the whole business is a monopoly (Simpson, 2011, adapted by the authors).

Both policy-makers and economists as well as the whole society are concerned about the fact that monopolies are gaining more power. You can find two definitions of monopoly, but none of them give completely accurate understanding of the conception of competitiveness. The first economic definition used by many economists is irrelevant, since it is believed that the monopoly is the result of free market. The definition states that a monopoly exists where there is only one provider of goods and/or services and have no close substitutes for a given geographical area or high entry barriers deter other companies from operating in this sector (Mises, 1998; Simpson, 2011). The political definition states that the monopoly

arises from the government's initiative, using physical force to reserve the market or part of it to one or more vendors. The economic concept focuses on a number of industrial enterprises and size. In this case, you can customize the folk proverb: "the smaller the number of companies in the industry and the larger those companies are, the greater monopoly power exists there." Quite often monopoly power can occur naturally in the market when only one company remains. Based on this definition, we can formulate the idea that the bigger market share the company has, the greater the chance of it becoming a monopolist.

The political definition concentrates on the established government restrictions of competitiveness and argues that monopoly power can be considered as an alliance of small producers against one or several large producers, or vice versa. The longer the government protects the company from the competition – the size of the company is irrelevant - the more the company acquires monopoly power.

Example No 1. *According to the economic definition - Microsoft, US hardware and software manufacturer, Wal-Mart, the largest US retail chain in the world and the USPS, the US postal service - are regarded as monopolists based on their large-size and large shares of their respective markets. However, only the USPS company is a monopolist in terms of political monopoly in the context of the definition. Only because the state supports the company that allows it to dominate in its market. In fact, Microsoft and Wal-Mart are not monopolies in the point of view of political definition, they can be treated as monopoly victims. Wal-Mart has to deal with the local municipalities, because in some areas they establish insufficient maximum limit of square meters of retail for stores to be set up. Special issued orders are forcing Wal-Mart to open smaller stores, not the ones the company itself would like. This is a great example when small companies (for example, the local grocery or other retail stores), which are quite large in number, are using monopoly power to defend against a larger and more effective competitive opponent.*

Microsoft had to litigate antitrust laws (with companies such as Sun, Microsystems and Netscape), which prevented voluntary trade, for example, by restricting some of the firms' market shares in certain industries and stopping some companies from merger. Microsoft's case is an example of how using monopoly power, one can protect oneself from a competitor (in this case, from Microsoft), which produces better products and sells them more efficiently.

The main problem of the economic definition is that it groups together such companies as Wal-Mart and Microsoft, which have achieved a dominant position through voluntary trade with such companies, whose monopoly power have been reached with the state`s aid, for example, the U.S. Postal Service company.

Although a monopoly has such characteristics as high market share, in the real world it is not common to analyze and look for reasons on how it has become a monopolist. Therefore, the two situations should not be grouped together because the ways in which the company has achieved a dominant position are completely different and opposite to each other. Why?

Voluntary trade is part of competitiveness, while government intervention is an act which restricts competition. When a businessman is making all the efforts in order to attract and retain consumers, for them to voluntarily decide whether to buy or not a desired product, this process does not create a monopoly power, because it is a part of competitive process. The case in which the state subsidizes or otherwise supports business, protecting it from other competitors, shows restriction of competition that could create monopoly power.

> ***Example No 2.*** *Wal-Mart has achieved a dominant position in the retail trade, simply because of their ruthless competitive tactics. The company did its best to maintain its production costs and commodity prices as low as possible. For example, the company used a very effective inventory control system and demanded their suppliers to keep costs as low as possible. The company was guided by the motto: If a competitor cannot have Wal-Mart's costs and prices, so it cannot compete, it will be impossible for company to survive. Of course, most of the companies did not survive, because Wal-Mart has pushed them out of the market.*
>
> *The same cannot be said about postal company USPS. It became the sole first-class mail supplier, because the Constitution legally defended it against other competitors that can provide the same postal services. The government not only defended the company from other first-class mail suppliers, but also forced tax payers to subsidize it. If these steps were not taken, probably due to the appearance of competitors, the postal company would have been forced to retreat from the postal service market leaders.*
>
> *Wal-Mart and the USPS cases are drastically opposite, so it would be simply unfair to give them equal equivalent of monopoly.*

As can be seen from the example above, it is difficult to identify situations in which companies achieve a dominant position whether it`s because of their ability to better and more effective manage business, or from given privileges that facilitate the existence of the company and provide monopoly status. If we group the situations above together into one, we cannot correctly distinguish whether monopoly prevails. Just as with the larger market possession. Not always greater market share guarantees the right to monopoly power.

Consider the following situation. For example, if a company has its own product connected with the brand name, say Chevrolet or Ford, then every company is a monopoly, because every company is a brand seller. However, if someone broaden their definition and the product becomes not a nominal car but simply "car", then "Chevrolet" or "Ford" couldn`t be called monopolists. In this case, it is true, because all the manufacturers are competing with each other not over brands, but over types of transport, such as trains, buses or planes.

Depending on how the product is defined differs the concept of monopoly. In economic terms, it is miscellaneous. This is a subjective term, because it can be used to tell whether there is a monopoly or not. In general, one should not use terms such as "sole supplier", if the goods or services are not required by any user, then the competition in total does not exist. That is why the economic monopoly definition makes contradictory statements over monopoly.

> ***Example No 3.*** *Different economists gave ambiguous answers to the question of whether Microsoft is a monopoly. The answers were based on the different views on related markets to Microsoft and of the size of markets that belong to Microsoft. In Microsoft case, prejudices have been also seen in judicial decisions. For example, US District judge ruled that Microsoft is a monopoly and ordered to destroy the company, while the Federal Court of Appeal changed the destruction order. Thus, the findings of the Court inevitably affect the verdict, when the concept of monopoly is not fully defined.*

Analyzing the definition of political monopoly, one won`t find objections, an improper classification or confusion. Any vendor or producer, who the state protects from competition by licenses, tariffs, quotas, exclusive franchises and subsidies is called a monopolist.

Monopoly market power. Monopoly has the potential to earn large profits, as it has the power, which no other company has: the monopolies are free to determine the price at which they sell goods or services. Meanwhile, the other branches of the economy are strongly influenced by the pricing competition, and companies are

forced to charge lower prices than they would like. But how can high prices determine the company's monopoly? In fact, not every company monopolist can take the opportunity to raise prices too much. If the price is increased to the extent that it exceeds the potential competitive price level, the public will buy smaller quantity of goods or services, and will seek possible substitutes. Consequently, the monopoly`s sales volumes (and thus profit) will decrease. Thus, because of the excessively high prices, the company can harm its own interests. But it will certainly set the highest possible prices. In this regard, the monopoly is not unique - just like other businesses, it seeks to earn maximum profit, but it is unique within its existing market power, allowing it to earn huge profits.

However, do not forget that even if monopolies have significant market power, they experience costs. These costs are often higher than those faced by companies operating in perfect competition conditions (for example, to produce and sell your product or service, the monopoly may need expensive infrastructure or equipment, and it may be necessary to hire highly paid professionals with specific knowledge, and so on.). On the other hand, real business conditions in a similar manner can result in lower than average monopoly operating costs, compared with perfect competition company costs. However, in the absence of strong competition in the market, monopolies need worry less about how to reduce unit production costs. Of course, after finding ways to do this, companies increase their profit, but it is not a necessity. For this reason, (i.e. a low motivation to find ways to reduce cost of a unit production) companies monopolists` costs are often higher than those of the perfect competition market. Table 43 shows how different the average production cost of a monopoly and a company operating in perfect competition, determined goods` / services` prices and sales` volumes can be.

Table 43. Comparative analysis of a monopoly`s and a company`s operating in the perfect competition conditions factors

Factors	Monopoly	Perfect competition company
Average costs	22 Euro	18 Euro
Good`s/service`s price	32 Euro	23 Euro
Sales volume	850 pc.	1000 pc.

Source: developed by the authors.

As shown in Table 43, in order to maintain the desired profit level or for the businesses survival, intense competition creates constant pressure for perfect competition market companies to reduce the cost of unit production, so the average

costs of those companies are lower, compared with the average costs of monopolists. Higher average costs and the market power leads to higher market prices set by monopolists than perfect competitive market prices. However, by offering consumers lower prices, perfect competition market companies generate more of their goods`/ services` turnover than monopolies.

In any case, even if the monopolies` turnover is less due to high prices, they seek efficiency, i.e. want to earn as much profit from the costs experienced. To increase efficiency monopolies can use economies of scale assets that are not available for all perfect competitive, market companies, especially those working in the sector where competition is very intense. This is because the perfect competition market companies are often much smaller than the monopolies. Meanwhile, economies of scale effect increases if the company is expanding or growing. Economies of scale can reduce the cost of unit production, and in this case, even a monopoly may reduce its goods`/services` price and thus boost sales growth.

In addition to economies of scale, monopolies may seek the so-called dynamic efficiency. Dynamic efficiency refers to the pace at which:

- company reduces its production costs over time;
- company significantly improves its product/service over time.
- The company is considered dynamically effective, if it is able to rapidly reduce production costs and/or rapidly improve its product or service. Otherwise, the company is considered to be ineffective. The two main company`s dynamic efficiency factors are as follows:
- importance of dynamic efficiency;
- amount of money invested to pursue dynamic efficiency.

Although there are exceptions, basically the majority of monopolies are considered to be dynamically inefficient, because the opportunity to earn high profits do not encourage these companies to invest in the dynamic efficiency. In other words, low competition (or lack thereof) does not encourage monopolies to search for new solutions to reduce costs or improve products or services. Therefore, while monopolies can afford to invest in the above-mentioned aspects of business development, they do not see the need to do so.

Regulated monopolies. Monopoly can be conditioned by significant economies of scale, and vice versa. For example, if the company is able to effectively make use of economies of scale, it will gain significant advantages in the market due to lower costs experienced. Lower costs make it possible to earn higher profits and allow the company to grow. The rapidly growing company can develop their business to

very large volumes, gradually sweep its rivals and take over control of the market. In the market point of view, it is even effective, whereas small companies do not have such large benefit from economies of scale, the experienced costs are higher and thus higher prices. Therefore, it is not appropriate for consumers to choose small companies` goods or services at higher prices. In this case, even though in many countries there are the antitrust laws, the country's ruling authorities may decide that the best option is to allow the monopoly in the market, even if it has no competitors. However, the monopoly may be required to maintain the current price level, though, becoming a monopolist in the market, the company has all the conditions to raise prices. Monopoly that is partly controlled by the authorities is called a regulated monopoly. However, the number of economy branches, where such a situation is possible, is very low.

According to examples 1 and 2 we can conclude that Microsoft and Wal-Mart has no monopoly power, because their competition is not defended or supported by the state. Even more, we can say that the **monopoly does not occur naturally in the free market. Monopoly exists when government subsidies or in any other form of assistance intervenes in the free market mechanism.**

It should be noted that monopolies` reign does not last forever. As market conditions change and time runs, the company may lose its monopoly power in the market. Sometimes monopoly power disappears relatively quickly, within a few years, but sometimes it can persist for decades. For example, companies that maintained a monopoly on the patent, lose it after about 17-20 years, i.e. after the statutory period of patent protection ends. Other companies avoid such situations by reinvesting part of monopoly profits of the product or service for the qualitative upgrading and re-patent newly developed product production, design, and completion and so on, techniques and methods. However, for other monopolists this may result in failure. Although the barriers to enter the monopoly market seem insurmountable, big gains in the market acts as a strong stimulus for other companies to look for ways to get there. Although companies know that the chances of success are very low, they also know that the reward in case of success will be very high. Finally, if one or more companies manage to break the monopoly on the market, competition increases, the market is no longer a monopoly, and the monopolist`s reign ends. These markets tend to become oligopolistic.

3.2.2. Oligopoly

If each oligopolist seeks to maximize his/her own profit rationally and wisely, he/she will understand that if there are only two or more vendors, his/her own action has a significant impact on competitors. All this will allow competitors to understand that the stimulus to do something is without vengeance and without the desire to experience a loss. If the cake cutting will inevitably reduce each oligopolist`s profit, no one will cut it, although vendors are completely independent from each other. Result`s balance will be the same as if companies have signed the monopoly agreements (Petit, 2012).

Factors that lead to the formation of oligopoly are well known in economic history (Petit, 2012). Nineteenth century`s industrial revolution, technological progress (transport, energy, information technology), open market reforms (industrial and trade liberalization policies), accumulation of capital and the development of the financial sector led to the competition in the product markets. Due to the change in situation, all inefficiently working companies in the market dissolved, and the market has experienced tremendous concentration. Since the early twentieth century anti-monopolists suspected that oligopolists` behavior has caused a certain degree of *market failure*. Under certain conditions, oligopolistic companies are able to coordinate their prices (and/or other variable) and achieve together higher profit, without any institutional contract, without the establishment of joint ventures, trade associations and the like.

In other words, the market acts as a *conspiracy*, but at the moment this term in the market is not often encountered and used, it is often referred as *silent collusion* (see fig. 24). Silent collusion`s history is dated from the late nineteenth century to the early twentieth century, when the researchers tried to fill in the existing oligopoly scientific research gap. Scientists have developed a mathematical model to illustrate the competition process and results in oligopolistic markets. In 1838 scientist Cournot was the first to discover that the price`s balance in oligopolistic markets is above the marginal cost. In 1883 Bertrand has achieved remarkable results, foreseeing that the price in balance is equal to marginal cost. In 1925 he canceled both models. Bertrand has proven that oligopolistic prices were generally vague and ranged between low and high threshold (so-called Edgeworth cycles). Finally, in 1934 Von Stackbelger discovered that the price in balance is superior to the marginal costs, but lower than in Cournot model (Petit, 2012). Due to different and inconsistent results none of the created models gave tangible benefits for the development of the general requirements of the oligopoly. In addition, all models had restrictive assumptions, which further distanced them from the daily market problems. Despite all the listed faults the following models strength-

ened a major conclusion: **unlike the monopolists, competing oligopolists must take into account the best actions of others when preparing commercial offers**. The idea that oligopolists are "independent" has developed promising directions in the future economic science.

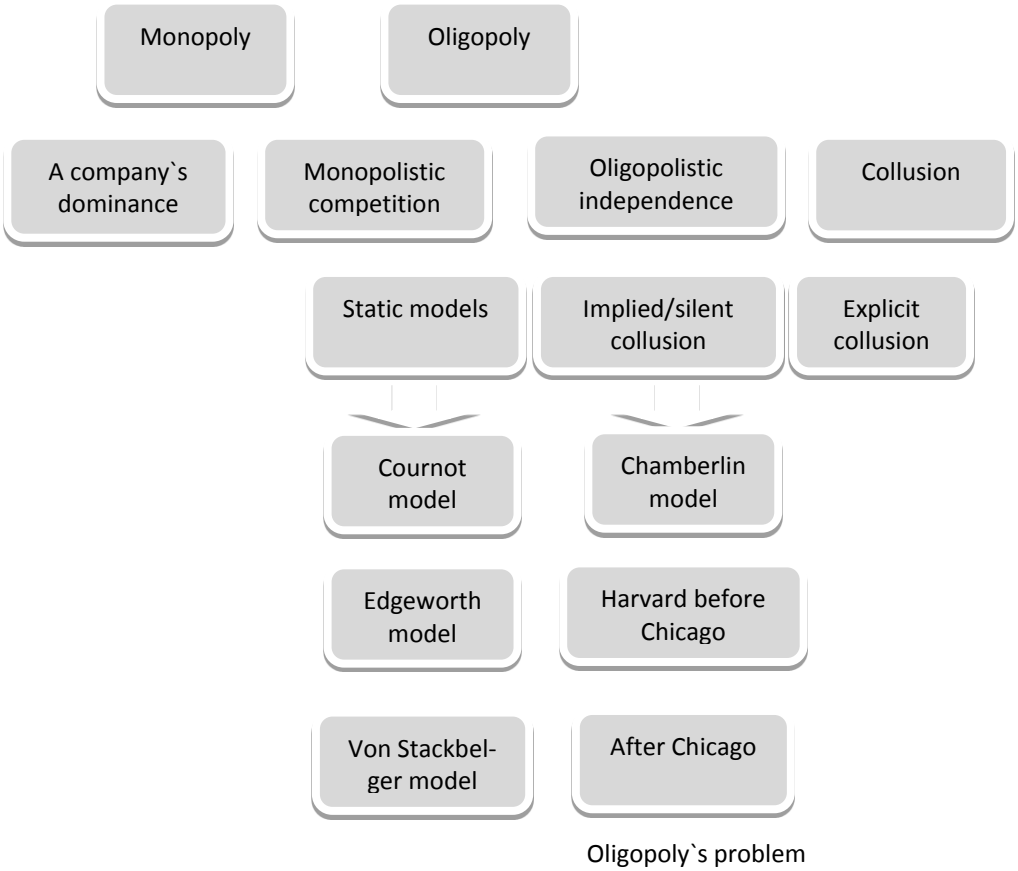

Figure 24. Silent collusion`s set of economic theories

Source: Petit 2012, p. 12

Another achievement in oligopoly theory occurred in 1929. Chamberlin determined that the interaction of two completely independent vendors can help to complete the competition in price in the absence of any operating or tacit agreement. This Chamberlin`s thought explained the existing oligopoly problem. First of all, if you take into account the existing oligopolistic competitors impact on the price, they consider their strategy against competitors and, secondly, they equate

prices to the same level, like “monopoly agreement". Such a dual system of actions is called "silent collusion" or "non-cooperation collusion”.

In 1960 new ideas brought to oligopoly theory emerged from Harvard School. According to the Harvard School followers, oligopoly is just bad monopoly. Another idea is that the silent collusion is the question of market structure. According to Chicago School experts, the oligopolistic market structures often produce effective results. In their view, the Harvard supporters made great economic mistake that without mathematical correlation and causation assessment, they denied that the oligopolists reached large profits only thanks to their efficiency. Chicago school supporters, however, remained with the ideology of silent collusion theory. In order to succeed in reaching a silent collusion certain conditions are required: market concentration, inelastic demand, entry barriers and the standard production costs to be similar.

Advanced discoveries of game theory in 1970 opened up new prospects for scientists researching oligopolistic market problems. Non-cooperation game theory showed that Chamberlin intuition was quite right. Intuition`s justification is based on the classic prisoner's dilemma (for more details see. Section 2.4.1): the two suspects unable to communicate with each other give up and inform on each other, though it would be better to remain calm and silent. These dilemmas transferred to oligopoly suggest that independent companies would better choose to compete than negotiate. Nevertheless, this dilemma is only valid for one-time gambling. In markets where companies are constantly meeting and competing with each other dozens of times, the agreement becomes more acceptable. If an oligopolist decides to deceive his competitor, he can be mercilessly removed from the game.

In Figure 24 the given oligopoly issue partly shows the general theory of oligopolies. The oligopoly problem also applies to the theory of collusion, specifically – the theory of non-cooperative collusion (or the theory of implied collusion). The theory of non-cooperative collusion differs from theory of cooperative collusion (or the theory of obvious collusion), which focuses on the oligopolistic behavior, coordinated through formal agreements. It is important to note that the oligopoly issue has little in common with Cournot and Bertrand literature on competition. In these models, the independent oligopolistic markets` activity is being researched in the static structure, which is opposite to the dynamic structure of the theory of non-cooperative collusion. Many of the latter theory-based models focus on the oligopolistic company’s durability, market`s stability, when changing the operating conditions (for example, a more differentiated product, increases the number of businesses, changing advertising etc.) or introducing new market analysis procedures (e.g. empirical analysis, game theory etc.). This research orienta-

tion may even be regarded as not the collusion based principle of oligopolistic theory of cooperation.

If you ask the question "Is it a real competition between several competitors in the market?" the answer is simple, "Yes, if those competitors are willing to compete, then such competition can be very effective." Oligopoly is a market structure in which there are several producing/service providing companies, supplying all or most of the market and the industrial decisions of which can largely affect the actions of competitors. The most frequent examples of oligopolistic structures in the literature are commercial centers, the banking industry and the pharmaceutical companies.

Oligopoly has main characteristics:

- low number of dominant large companies in the market;
- high degree of independence: companies` behavior is strongly influenced by other competitive companies;
- high market entry barriers, which impede new companies to enter the market, such as technology control;
- price stability in the market;
- goods are highly differentiated or standardized;
- there is no price competitiveness strategy, i.e. other consumer attraction and loyalty acquisition channels are used, such as free delivery and installation, extended warranty term of validity;
- limited access to information.

Oligopolists do not compete on price, because it is simply not profitable to do so. Price wars lower profit, forcing companies to change market share. However, oligopolistic companies tend to set reasonably higher prices and compete through advertising and other support measures. Existing oligopolistic companies are protected from the new companies entering to the market, because entry barriers are high. For example, if the product is highly advertised and producers have a number of successfully existing brands, then for new companies it may be too expensive and complicated to set up their new brand in an oligopolistic market. Since in the oligopolistic industry there are only few companies, each company's product occupies a large market share. As a result, each company's pricing and capacity decisions have a huge impact on other companies' profitability. In addition, when the decisions are made related to the price or volume of production, each company must consider their competitors' reactions to the decisions taken. Because of this dependence, oligopolistic companies often behave strategically. What does it

mean to act strategically? Strategic behavior means that the company's best result is determined by the actions of other companies. In this case, oligopolists can choose two antagonistic behavior trends, whether to *compete* or to *agree* with each other. If they manage to reach an agreement, then they start to act as a monopolist, therefore maximizing all their market returns. However, companies often find themselves competing against each other in order to gain more market share and earn higher profit. From large oligopolistic competitions, the user always wins

Economic literature claims that oligopoly does not necessarily have to be made up of effectively working large companies. Nobel Prize winner Galbraith called the oligopolists "giant corporations" (Galbraith, 2007). In the popular and accessible magazines or articles oligopolists are called *Big Oil*; *Big Steel*; *Big Four*. Interestingly, since 1960, *large* oligopoly story has been a fertile ground for the antitrust policy prescriptions. On the one hand, the doctrine "*big is evil, little is good*" spoke out against oligopolies in the belief that large corporations can hurt small businesses, on the other hand, the doctrine "*there is no business, but big business"* followers argued that oligopoly should be tolerated because large companies are more efficient in cost respect and they finance innovations through the mass scientific researches and development costs.

In the real world the story of the "big" oligopoly is just a legend. Most real-life operating oligopolies consist of small and medium-sized companies, such as local market oil distributors, grocery products. Oligopoly existence only shows that the total industry revenue / output is generated by a small number of companies.

In the oligopolistic markets the Game theory is valid only if there are following four conditions:

- oligopolists must share a common understanding about the price, which redeem collusion, otherwise they will raise the price to different levels and then in the market will prevail strict competition;
- must be "credible threat of retaliation" against opponents, consuming any temptation to deviate from the rules of the game;
- oligopolists must check each other's prices, detecting in that way possible competitive deviations;
- silent collusion`s price stability is determined by oligopolists` ability to prohibit other companies from entering the market.

Despite the optical illusion of the market size and scale, it is possible to agree with the statement that in the oligopolistic market, each company has a relatively high market share. However, the existence of oligopolistic markets is a poor basis to be

able to provide any suggestions for anti-trust policies formation. The primitive doctrine of Harvard School that oligopolistic companies' market shares are indicative of abnormal existence of market power, is quite outdated. Many economists do not even accept the Chicago School examined correlation between the oligopolistic market shares and cost and innovations.

Of course, oligopolistic markets may induce production efficiency in economic sectors where are high fixed costs. However, there are sectors where fixed costs are not high. For example, labor-intensive sectors or non-capital-intensive industries such as legal or any other type of consulting services. In addition, the sectors where fixed costs are high, oligopolistic market shares are still not optimal, compared to the monopoly of the market share.

The fact that the market structure is oligopolistic does not say anything about the size of the company. Also the claim that the company owns oligopolistic market share does not give specific information about the company's market power or efficiency. For this reason, companies` decision-makers should not make any conclusions with certainty based on information of oligopolistic market structure or other companies belonging to the oligopolistic market.

Summary: *nothing has changed in the use of the term "oligopoly" or "monopolistic competition." Both terms are validated by the regulations that identify monopoly power. Nowadays economists define "monopolistic competition" situations where the companies` products that vary very little from one another, such as grocery business or gas stations. The term suggests that monopoly power begins when there is a small difference between the goods. In business literature there is deeply rooted stereotype that the criterion of "sole supplier" is sufficient to approve monopoly power. "Oligopoly" is applied to identify the industries to which belong companies that have the largest market shares, such as the motor or steel industries. This concept is mainly based on the number of companies and distinguishes industries where monopoly power varies between monopolistic competition and its markets.*

The best way to analyze the competitive types is through the prism of competiveness. "Compete" - means to differentiate products, reduce costs and prices, advertise, pushing away competitors out of business through the loyalty of customers to the company.

3.2.3 Perfect competition`s market

Simpson (2011) cites in his work Hayek (1948), who defined the perfect competition as: it is not a form of competition in general; its meaning is the absence of any competition. According to the perfect competition theory, there is no competition in differentiating products, gaining economies of scale and reducing its production costs, obtaining or disseminating information. **In the economical course books distinguished perfect competition features form a false concept of competitiveness, because in reality this type of competition simply does not exist.**

According to Krivka, Ginevičius (2009), perfect competition is characterized by absolute production mobility, perfect information about the resource and output prices and free market entry or exit, which leads to a long-term market for companies operating in a zero economic profit. In other words, pure competition corresponds to a situation where many businesses compete in the market and market development; the availability of positive profit disappears and steady-state competitive company`s profit equals to zero. The perfect competition, as seen from the society`s point of view, is considered to be the most effective structure of the market. However, the perfect competition model`s assumptions, such as product homogeneity, perfect information, the minimum average production cost, perfect mobility of resources and so on, make reasonable doubts about the practical applicability of the model. "The perfect competition" interests a lot because it is a purely theoretical example that does not exist in the real world. According the perfect competition all sell completely identical goods, anyone can trade, and vendors sell so little goods that no one of them can affect the price. We can ask a rhetorical question: "Why is it such a useful example if it does not exist in reality?" Let's try to analyze this type of competition in more details and see the discrepancies between theory and real life situations. The analysis is based on the Simpson`s (2011) conducted insight about monopolies and competitive markets.

First of all, let`s assume that all products must be identical in order to achieve perfect competition. What does this mean? This means that there is no competition in order to gain exclusivity over the product quality and style. If perfect competition existed in the market, companies would not be able to try to make their products exceptional or better. So, the term "competitiveness" does not include one important aspect of competition. Moreover, there would not exist the variety of goods. However, it can be easily noticed that competition in the market has quite the opposite effect. **Secondly, what do you think about the idea that the industry has a large number of small companies, so that to be considered as a perfectly competitive?** This idea does not embrace competition, when companies in all possible ways try to reduce their costs and gain a competi-

tive advantage over their competitors through the economies of scale. If each industry consisted of many small companies, then the costs would be higher in most sectors, resulting in lower productivity and inferior quality of life. Again, this is precisely the opposite result than competition really gives. **Third, do you like the idea, that the industry should have slight entry and exit barriers in order to be considered a perfectly competitive?** This idea ignores the fundamental difference between the two market entry barriers, i.e. natural and conditioned by the state. Natural barriers, such as high capital requirements and brand loyalty, knowledge of how to produce a certain product are parts of competitive and voluntary trade. For example, companies acquire consumers` loyalty, producing goods that consumers like. In this case, it is not very easy to switch to another brand. State`s identified barriers impede competition and voluntary trade. The state forcibly keeps some companies from competing with other companies, such as granting a franchise to electricity producing companies, cable television, etc. In that way making more complex competitive conditions to some companies, such as tariffs, quotas, licenses, or giving an artificial competitive advantage to certain companies, such as the form of grants. These barriers restrict competition. Ignoring the fundamental differences between the two entrance barriers into the market, the perfect competition builds these two different things into one whole, and says that when there is *a barrier*, competition is reduced. Thus, the perfect competition market builds such industries as New York taxi, which has large state barriers and computer hardware manufacturing company with high capital requirements. This market claims that both companies lack competition because of the mentioned barriers. However, it is not so far from the truth. Computer business is very competitive due to high capital requirements and low costs. For companies in this field to achieve low cost is one of the components of competitive process. New York taxi business is very limited by the government as to start the legitimate business it is required to purchase a locket, costing from 400 000 to 500 000 dollars. This circumstance keeps most of potential business operators outside the taxi business.

Fourth, do you agree with the statement that in the perfect market competition`s traits exists perfect information? Frankly speaking, it is an absurd. Perfect information means that people have to be omniscient, for such a market to exist. However, part of the competition is the competition related to information and knowledge. Thanks to the competition the knowledge is acquired about production techniques, consumers and about the choices of methods of spreading the information. If it is assumed that we still have the perfect information so that we may gain a perfect competition shape, again, we contradict the basic element of competitiveness that exists in reality.

The fifth statement describing the perfect competition is as follows: the perfect competition market`s participants are price-makers. This statement ignores the fact that most companies set prices on the basis of production costs. Companies compete intensely, reducing their costs by setting lower prices, thus gaining a competitive advantage over their competitors. Therefore, demanding that companies would become price takers, we violate the conditions of competitiveness.

> ***In summary,*** *it can be concluded that, as it is highlighted by many economists, the perfect competitive market does not exist in reality. Sometimes you can find statements claiming that the agricultural industry, in the sector such as wheat or other grain crops cultivation, is close to the perfect competition, because the products are identical and farmers adopt and set prices that are on the goods market. However, even these industries do not meet the standards of the perfect competition market. First, the entrepreneur has to have a lot of capital, if he/she wants to be in the agricultural business. Second, the perfect information does not exist in the agricultural or other industry. Third, there are high barriers in such type of business due to the high capital requirements and knowledge necessary to enter the agricultural market.*

Competitive markets summary is presented in Table 44.

Table 44. Comparative and summarizing the competitive markets analysis

	Monopoly	**Oligopoly**	**Monopolistic competition**	**Perfect competition**
How many sellers in the market?	Only one	Few	Many	A lot
How looks the product?	Only one product	The same or slightly different products	In fact, similar, but artificially different products	All the products are identical
How much power has a vendor?	Very much	Much	Not much, but enough	None
How much power has a consumer?	Very little	Not much	Has, but generally not much	Very much, the freedom of choice

	Monopoly	Oligopoly	Monopolistic competition	Perfect competition
Is a vendor big?	Mostly big	Mostly big	Mostly big	Very small, so small that has no effect on the price
What limits the vendors` opportunity to set a price?	The amount of money consumers have, appearance of a new competitor	Vendors that are actively matching with each other`s actions	Vendor	Vendors are so small that have no effect on the price
Is it easy for a vendor to enter the market?	Practically impossible	Difficult, the existing players may interfere	Difficult, necessary to invest in a new brand	Very easy, there are no barriers

Some of the criteria are ambiguous. It is not completely clear what is the difference between "much" and "very much", so in an attempt to characterize the market, it is necessary to use a set of criteria. But even then some markets can be difficult to specifically assign to the description.

3.2.4. Entrance barriers to the selected competitive market

In order to gain a better understanding of the competitiveness types, particularly of monopoly, you should look into the entrance and exit barriers of the market, which are based on the concept of political monopoly. We will discuss the main entrance barriers to the market (Simpson, 2011):

- ***Patents, copyrights, trademarks.*** It should be kept in mind that the monopoly power exists only when the state initiates promotion of the market or its part to the one or more vendors. According to this statement, patents, copyrights and trademarks do not create a monopoly, even if it is believed that under the economic monopoly definition are the mentioned entry barriers created. Patents, copyrights and trademarks protect intellectual property from being used by others without the owner's consent. Patent, copyright and trade mark protection helps to increase efficiency, quality and supply of goods to those who seek prosperity and good reputation. Patents give the opportunity to develop new or improve existing inventions. Copyrights give the ability and incentive to produce higher quality goods. Brands provide a strong impetus to gain quality through

self-imposed company's reputation. These examples are the opposites of monopoly. It could be discussed why. Monopoly reduces economic efficiency, quality and supply of goods, because they violate the rights of individuals to protect producers from competition. Economic competition exists only in the voluntary trade, and it can exist only when the individual rights are protected. Based on the legal monopoly understanding, patents, copyrights and trademarks do not mean monopoly.

- **Economies of scale.** Operational efficiency through economies of scale also does not constitute a monopoly, although the economic definition of monopoly very preaches this barrier. Economies of scale is achieved through intense competition by reducing costs, capital accumulation, the acquisition of knowledge, efficiency during manufacturing process and quality improvement. Potential market participants, of course, if they want to successfully compete, must achieve low production costs, which have been already reached in the chosen industry. If the state provides new companies with the capital and knowledge, for example, reveals the trade secrets to the new participants, it represents a monopoly in respect of those who have not received capital and knowledge from the state. The government should take the campaign of violence: either to force the existing companies to reveal to the newcomers their trade secrets, or to force taxpayers to support the novice, purchasing only their products. In any case, it would lead to lower productivity. On the one hand, the companies would be deprived of the ability and incentive to gain more knowledge (the companies should give to the novices hardly acquired knowledge). On the other hand, the companies would be deprived of the financial incentives to remain efficient and produce goods that meet the demand (the newcomers would receive funding from the taxpayers, so there would be no need to improve their financial situation by attracting investors independently).

- **The sole resource control.** The acquisition of sole resource control does not create a monopoly, if it is achieved through a voluntary trade. If someone sees an opportunity to buy up the entire supply of resources, it is considered as a personal achievement, based on the individual's ability to acquire these resources. Such a resource acquisition is based on a voluntary trade and does not restrict competition. In addition, huge opportunities arise to gain a competitive advantage by distinguishing and expanding specific resources. Such activities help to raise the productivity of the economic system. We can present the aluminum industry example, when in the middle of twentieth century “Alcoa” controlled the entire land, consisting of bauxite ore chemicals substances, from which aluminum is pro-

duced. Apart from Alcoa's efforts to invent better ways of producing and using aluminum, the aluminum industry and the development of industries that heavily dependent on the aluminum sector development (such as airplanes), the development would be much slower. In case when a voluntary trade and resources are deducted, this violates the rights of individual companies and the monopoly is formed.

- **Network effect.** Network effect leads to monopoly power, because the network creates a swap costs and allegedly locks the company, making it dependent on the network. For example, often argued that people can tie up to poor standards or product just because it was the first product to gain significant market share. Moreover, it is further stated that it is impossible even for the high quality goods to form poor network. This was the case for such goods as typewriters, operational computer systems and computer software. Even if the attachment and dependency on the network exist, they themselves do not create a monopoly as long as the widely accepted standards of free trade. For example, not very effective typewriter`s keyboard QWERTY (these are the letters on the upper left side of the keyboard) has gained popularity among users just because it was the first such typewriter widely used all over the world. A newcomer offered higher quality keyboard DSK (or DVORAK), but did not receive such a great success solely on the fact that users have already recognized the QWERTY keyboard. DSK was superior to the QWERTY because the keys` layout enabled faster typing. Network effect monopoly supporters claim that no one will learn to use the DSK keyboard, because it is difficult to find a person who can teach. However, the study showed that the QWERTY keyboard was faced with intense competition in the end of nineteenth century, when the counter for standard keyboard input was fierce. In addition, DSK keyboard has not shown sufficiently serious advantage over the QWERTY keyboard.

If the government has intervened and helped the company to overcome the transition costs, that would create monopoly power, even if the company itself has a better product that would dominate in the market without government`s assistance. The government would initiate actions against the taxpayers, urging them to subsidize the company's new product. While such aid does not lead to inefficiency and introduction of poor standards, the government's intervention, however, would help the company reduce the transition costs.

3.3. Expert selection criteria

In order to obtain accurate results of empirical research and reveal the game theory application patterns in separate competition markets, there was defined accurate expert portrait. As perhaps the most basic and the most important criteria for selecting experts are:

- an expert represents the company in one of the competitive market types;
- an expert is the company`s or its unit`s executive at least for one year, who is in charge of the company's policies and its position in the market.

It is worth mentioning, that the smooth cooperation between science and business is still in the embryonic stage. The research was limited by very high experts' employment, fear of disclosure of trade secrets and the lack of executives` contacts publicly available on companies' websites. These research limitations were resolved by selecting the Snowball sampling. According to Vogt (1999), a Snowball sampling is a research method in which one investigator says another potential investigator's name, the latter suggests third investigator`s contacts, and so on. The Snowball sampling method can be used for two main objectives. First, it is an informal approach to reach the target group, which helps to identify a hidden population. The Snowball sampling method is commonly used in qualitative research, usually in an interview. Second, the Snowball sampling method can be used as a more formal methodology for drawing conclusions about the individuals that are difficult to reach in the population, instead of household surveys. In addition, the Snowball sampling-based methodology is a valuable tool for a lifestyle analysis of groups that are difficult to reach (Atkinson, Flint, 2001).

The experts representing different types of competitiveness and managing businesses or groups of companies were questioned using the Snowball sampling method.

Since Lithuania has least monopolists, they were first selected as competition experts; later emphasis was directed to oligopolists and perfect competitive market players. The second stage of the investigation consisted of in-depth interview about the application of game theory in the negotiations. The interviewed experts were requested to indicate the basic principles in negotiations.

3.4. The logical structure of the research

The aim of the research is to identify the game theory strategy`s patterns and differences in the separate competitive market types. In order to achieve the objective, the authors after receiving the results of the empirical analysis will complement or deny the existing competitiveness theories, that the game or game-based strategies are typically found and used only in oligopolistic markets. Before the implementation of the target a pilot in-depth interview with Lithuanian monopolists executives / department heads was carried out: Lithuanian Railways; Lithuanian Post and Teo LT.

The interview showed that in Lithuania acting monopolists exist in the market not only as the only service / product providers, but also operate as the perfect competitive market players or oligopolists. Thus, **there is no** recipe or the game theory strategy to handle business decisions.

Lithuanian Post. In the common postal services market according to 2016 I quarter`s revenues Lithuanian Post had the largest market share (34.7%), the second place was taken by DPD Lithuania (18.3%) (The Communications Regulatory Authority of the Republic of Lithuania – RRT, 2016). However, according to the revenue generated from shipping sent through the postal network in 2016 I quarter Lithuanian Post took 91.3 % of the market, JSC "Greitasis kurjeris" - 5.9 %. Namely providing this service the company acts as a *monopolist*, which main objective is to ensure the availability of services for each resident of Lithuania. In the other services` sphere, such as courier services, Lithuanian Post acts as the perfect competitive player (market share is only 3.7 %). The company encounters fierce competition (DPD Lithuania - 35.7 %, JSC "Venipak LT" - 22.1 %, JSC "Baltic Post" - 15.9 %, etc.).

Lithuanian Railways offers as a *monopolist* in Lithuanian market only passenger shipping services. Other services, such as freight transportation, multimodal transport, intermodal trains, intermodal terminal services, storage, wagon and container rent, wagon repair and other transport and logistics, the company dominates in the transport and logistics market, but has large local and foreign competitors (for example, Latvian Railways, ORLEN Lietuva, etc.).

Teo LT. Teo LT, as a monopolist, provides fixed-line telephone services. On the other hand, the company operates in different markets, with the different intensity of competition. For example, in the sphere of the internet communication services the company has acquired strong position, but also has strong competitors. The internet providers in Lithuania are counted in tens. Another service is paid television, which competes with cable TV and such companies as the C-gates,

Vinit, Viasat, all the regional cable television and so on. As a complete newcomer Teo LT provides IT services and competes with the old-timers BlueBridge, Alna, Atea, and many other IT solution providers. In equipment sales the company competes with all the operators and supermarkets, which sell televisions, computers (including tablet computers and game computers), phones, various accessories, equipment for the smart houses (cameras, home security systems, etc.). By providing international traffic transit services Teo LT competes with other countries` operators for transit traffic. It is worth noting, that in 2016 on January 4 Teo LT acquired mobile operator Omnitel. Since that date, the two companies are managed by a single management team, because of this the company is both an old-timer and a new market player.

Lithuania with a population of less than 3 million has a very low consumption market, and it does not have numerous producers. Due to too tight market in Lithuania other producers and service providers are not very eager to interfere. This condition – is a great opportunity for oligopoly to appear for food supermarkets, breweries, mobile operator services, milk producers and pharmaceutical wholesalers. In the research there were experts representing the oligopolistic companies in such industries as brewing, pharmaceutical, agriculture (agribusiness), construction and production sectors. The experts have identified themselves as oligopolists and indicated the business sphere in which the company operates. The perfect competitive market representatives, who agreed to become experts in this research, mainly concentrated in the furniture manufacturing industry, beauty and fitness, translation and consulting, security services. The experts involved in the research wished to be unnamed, that is why in the third stage, conducting an in-depth interview about the negotiations art, their responses were analyzed in general form, highlighting the essential principles of the negotiations in different industries. The research`s order and its logical scheme are presented in Figure 25.

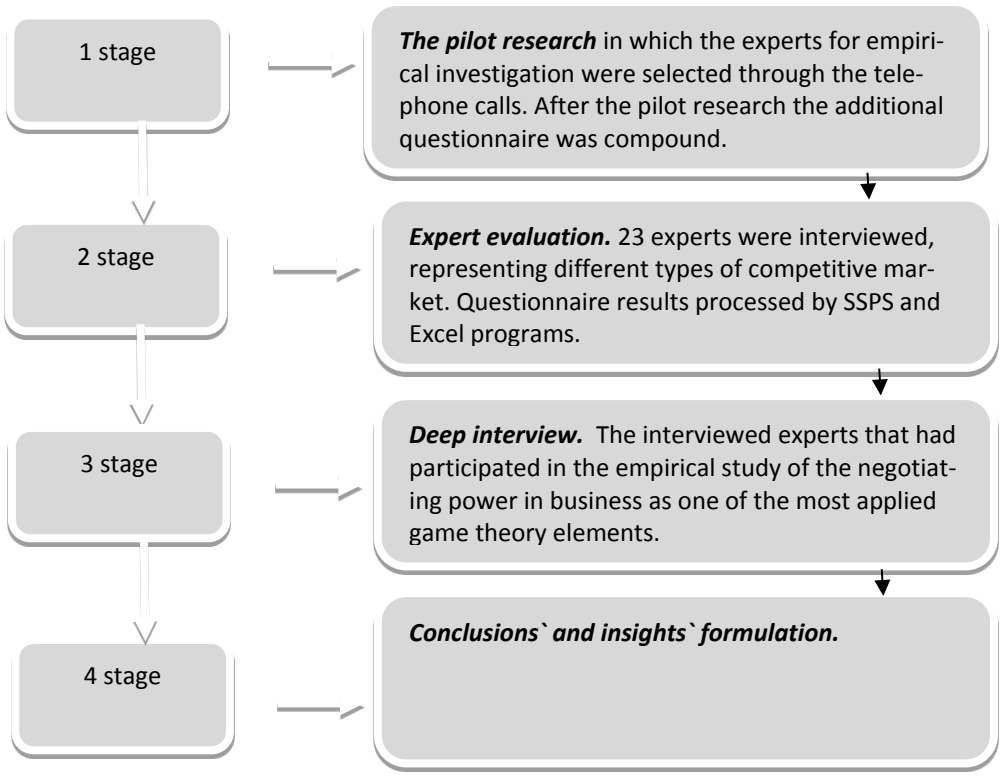

Figure 25. Empirical research logic scheme

Source: developed by the authors.

4. GAME STRATEGIES` EMPIRICAL RESULTS MAKING BUSINESS DECISIONS

4.1. Expert Evaluation Results

The first part of the questionnaire was designed to gather general information about the experts. The initial authors` idea of the monograph was to interview the experts from different types of competition in areas such as the furniture industry (perfect competition), telecommunications and communications, technology and food industry (oligopoly) and the main monopolists operating in Lithuania mentioned in section 2.4. Faced with the problem of the information availability, it was decided to expand the field of business areas. In Figure 26 is shown that the other business areas including agriculture, beauty, safety, translation services, transportation, metalworking, and pharmaceutical industries accounted for 78 %.

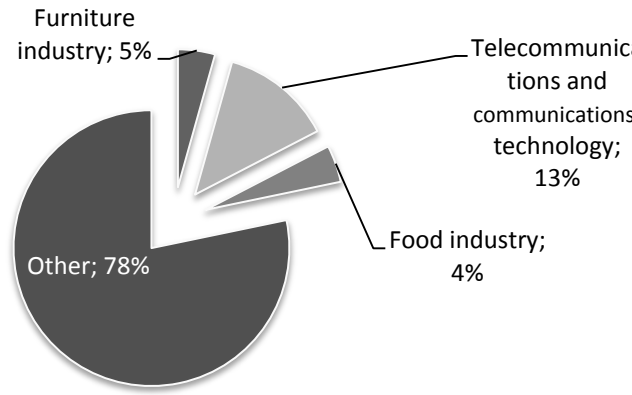

Figure 26. Experts` business area

Source: developed by the authors according to the expert assessment results.

The selected experts were competent professionals of their field, with rich experience in business management. Figure 27 shows that 39 % of the executives had experience in business management from 5 to 10 years; 11-15 years of experience were indicated by 22 %, more than 16 years of business management indicated 9 % and up to 4 years of managerial experience had 30 %.

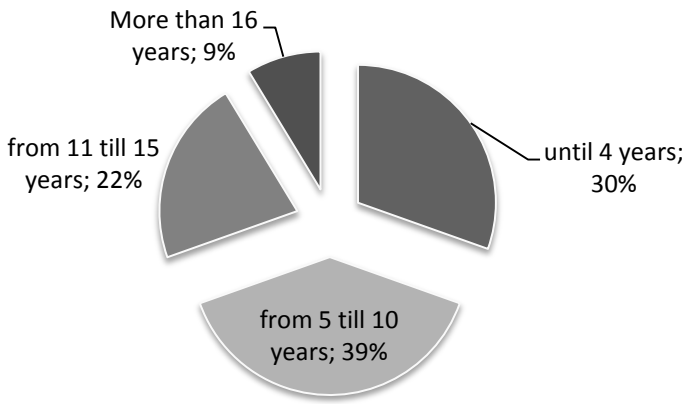

Figure 27. Experts` experience in business management

Source: developed by the authors according to the expert assessment results.

The experts' distribution by competitiveness types can be seen in Figure 28. Total number of participants was: 4 % of monopolists, 41 % - oligopolists and 55 % - perfect competitive market members. Such distribution reflects the real situation in the market, when the perfect competition takes the leading place in the market, then go oligopolists and only few monopolists.

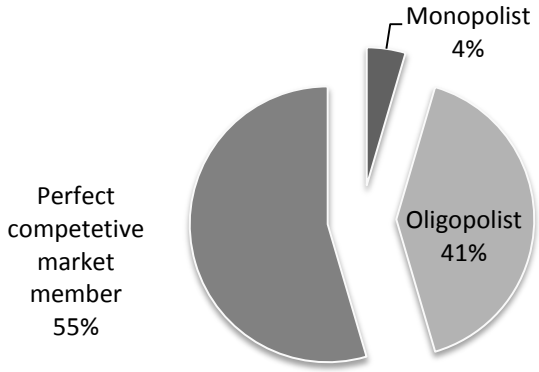

Figure 28. Experts` distribution according to types of competitiveness

Source: developed by the authors according to the expert assessment results.

The second part of the questionnaire was designed for the application of game theory to evaluate business opportunities. First, the experts were given the game theory concepts` statements, asking to point out the concept that best fits their business. The results are systematized in Table 45.

Table 45. Gambling theory concept matching to business decisions, mean values

No.	Gamble theory concept	Mean value, p value 0,0001 $W^a = 0.224$
1.	Mathematics education theory, which seeks to provide individual gamers` strategy results, when they do not have all the information about the other players' behavior. Game theory is applied in the economy, in order to predict the behavior of market participants (Economic glossary).	3.87
2.	Gambling theory deals with collective decision-making process when two or more of the decision makers' interests do not coincide. (http://ekonomika.tv3.lt/ekonomikos-terminu-zodynas/losimu-teorija#ixzz4CJOt6i79).	3.17
3.	Gambling theory deals with irrational individuals (players) behavior, whereas the chances of winning the game is much lower than the probability of defeat (by Kumar, 2009).	2.74
4.	Gambling theory is a method to resolve conflicts of interest, which is appropriate to apply to adopt the optimum solution between two or more entities in uncertain situations according to Myerson (2013).	3.87

According to the authors, if the mean value is equal to 3.5 and less, it considered that the claim / factor / proposed concept is not important. If the average value is equal to 3.51 or more - the proposed statement is confirmed. As can be seen from the results, the answers are relevant, although experts' opinions` concurrence is weak. Both offered game theory concepts, marked by numbers 1 and 4, gathered even score (mean values equal to 3.87 points). The experts who participated in the research associate game with various conflict resolutions in an undefined situation. Also, game theory is applied when there is no comprehensive information about a competitor, supplier, partner or customer. The experts were asked to offer their game theory definition which would best describe the game theory principles used in their business. According to experts, game - is the common transaction`s formation and the pursuit of common benefit between several or more competing sides. It can be seen that the experts tend to perceive the game theory

as mutually beneficial cooperation with competitors, and as the necessary tool to analyze conflict situations, especially when circumstances are difficult to define.

After ascertaining the experts` approach to the concept of game theory and its applicability in business, the experts were asked to identify how the application of game theory strategy can serve the business. Analyzing the experts` overall position, it can be stated that *the game strategy can help to form relationships with other businesses* (21% of the experts have chosen this option); the second place (17.7% of respondents) hold the following response options according to importance and frequency: *it can help to maintain and increase the company's competitive advantage* and *can help to achieve the company's targets* (see Figure 29).

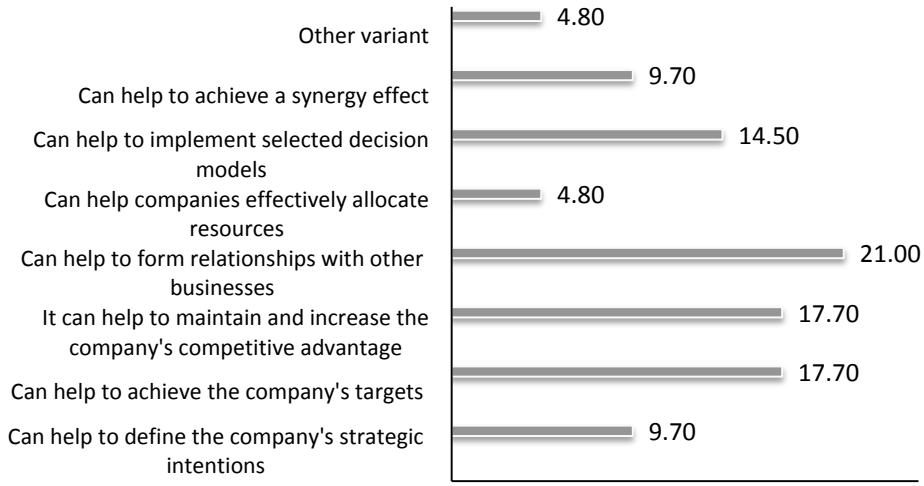

Figure 29. Game theory strategy`s application to the business (%)

Source: developed by the authors according to the expert assessment results.

The lowest percentage of the experts (4.8%.) indicated that game strategy can help companies effectively allocate resources. In addition, the experts pointed out other game strategy application priorities in business, such as *game can help to increase sales* or *to negotiate*.

If you perform a benchmarking of three types of competitiveness, you would perceive these basic patterns and differences (see Figure 30):

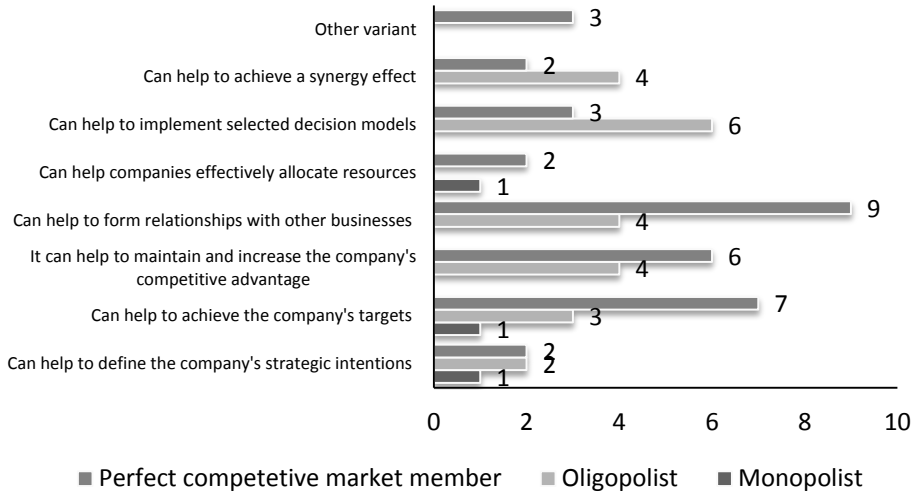

Figure 30. Game theory strategy`s application possibilities in business according to types of competitiveness, answers frequencies

Source: developed by the authors according to the expert assessment results.

- Perfect competition players, compared with oligopolists or monopolists, due to their small size, small market share, a significant impact on prices or other strategic decisions envisage more application possibilities of the game theory strategy. The most basic game theory application possibilities distinguished as formation of business relations with the other market participants, achieving the company's objectives and the maintenance of a competitive advantage.
- Oligopolists envisage the gameg theory strategy`s adaptation prospects for accepting selected decision models and achieving synergy2. Next we can identify similarities with the perfect competitive market: formation of business communications, achievement of competitive advantage and company`s objectives. The executive-oligopolists identified above as important.
- Completely opposite application possibilities of game theory strategy were identified by monopoly representing experts. According to the experts` answers game can help to achieve the company's goals, to define the company's strategic intentions and effectively allocate company`s resources. The above theory reveals that monopolists tend to compromise, negotiate and enter into the collusion only when it is strategically effective to the company`s long-term goals.

The game theory`s application into practice is presented in Figure 31. As can be seen from the data 30.4 % of experts apply the game theory every time in an undefined situation to make business decisions. 26.1 % of experts apply the game theory both occasionally, when in need to make key strategic decisions, and in extremely rare cases. 17.1 % of experts pointed out that they do not apply game theory in their business. Among the respondents who do not apply the game theory in their business, has been a monopolist, whom the state has granted exclusive conditions for the postal services` provision, therefore he has no one to compete with. Also there have been the perfect competitive market players, who have been following their intrinsic values in business, that are more important than the game theory principles.

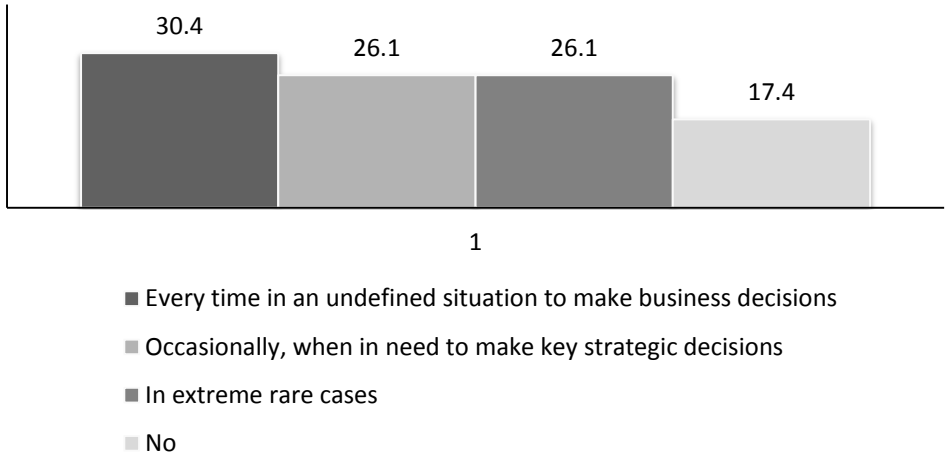

Figure 31. Do you apply the game theory when making business decisions in your company? The expert answers` frequency (%)

Source: developed by the authors according to the expert assessment results.

[2]Synergy, or coexistence - is a phenomenon in which two separate factors acting together suggest a greater impact than the sum of impacts of the two factors operating separately. It is a system of several elements (factors), acquiring new properties, which does not have every element separately.

Those replying that use the game theory`s principles and its tactics, had to mark on the Likert scale sets of objectives, to which the game theory is the most commonly applied for making business decisions or the conflict situations. It is acquired that the experts` compatibility is feeble, but statistically significant ($p = 0.000$; $W^a = 0.173$). Based on the monograph theory`s material, the following main sets of objectives can be singled out (see Figure 32):

Figure 32. The purposes for which the game theory`s science is used at the theoretical level

Source: developed by the authors

Analyzing the data of *the competitive cooperation assurance factors*, it can be stated that in practice the principles of the game theory and the tactics are used to achieve two main objectives (see Figure 33):

- in order to establish a competitive cooperation with business competitors for mutually beneficial results (mean value equal to 3.71 points);
- negotiations, to gain the bargaining power (mean value – 3.79).

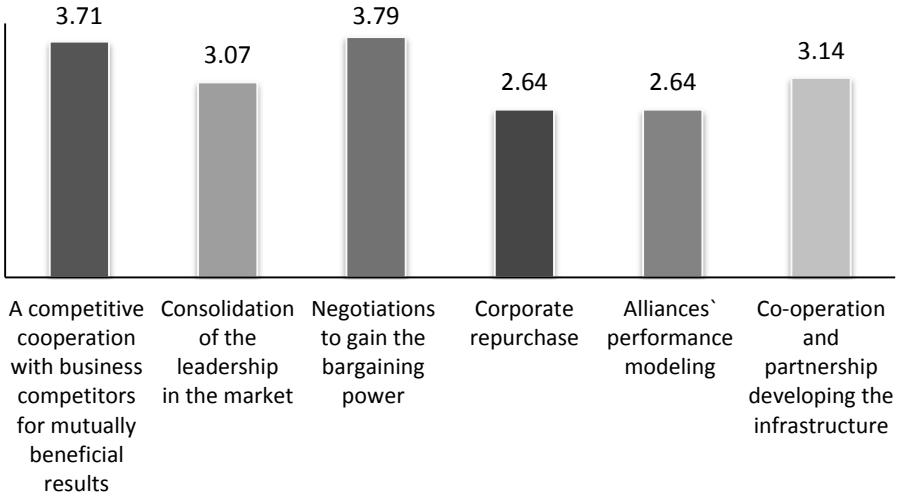

Figure 33. The competitive cooperation assurance factors` mean value

Source: developed by the authors according to the expert assessment results.

Other objectives (consolidation of the leadership in the market, corporate repurchase, alliances` performance modeling and co-operation and partnership developing the infrastructure) have been marked as not important or that the game theory does not apply here. The calculated values of the answers are less than 3.5 points.

The game theory`s principles were not mentioned in supply chain management, economic and financial decision-making, and the company's intellectual capital objectives (systematized results are presented in Table 46). It means that **making these decisions they do not need to follow the tactics of the game theory.**

According to the authors, one of the reasons why the application of the game theory was not named in any of the factors listed in the Table 46 is the exclusion of the logistics chief executives from the list of experts.

Other reasons for the findings could be the following:

- As the data in Figure 30 has shown, the monopolists, who mainly use the game theory to achieve the strategic companies` objectives (in this case, the economic and financial decision-making), often do not apply the game theory. Why? They simply have no one to compete with, there is no need to negotiate and so on. For those who have indicated that they do not use the game theory in business was not optional to continue the questionnaire.

- Company`s intellectual capital is its unique driving force, that provides a competitive advantage in the market, so in this area the game theory`s tactical proposals are not accepted. That is why it is relied on a more thorough analysis, monitoring and comprehensive corporate performance evaluations.

Table 46. Supply chain management, economic and financial decision-making and the company's intellectual capital assessment`s objectives mean values

Objective	Mean value
Supply chain management assessment	
The strategic integration of the game theory to supply chain management	3.21
Freight shipping optimization	2.57
Economic and financial decision-making	
Investment management	3.29
Foreign direct investment strategies` management	2.64
Company`s intellectual capital evaluation	
Company`s intellectual capital strategic scenario planning	2.86
Knowledge and information sharing within the company	3.50
Knowledge and information sharing with other companies	3.21

Source: developed by the authors according to the expert assessment results.

The business control and business risk groups objectives` order amount determination (mean value 3.64) and the market price risk management (mean value 3.71) were identified as objectives to which the game theory is not unfamiliar. Both objectives main point is the negotiations, i.e. to be able to agree on a compromise that satisfies two or more parties. To reach other objectives, such as the optimal business control method determination (2.93), risk avoidance (3), risk decision-making in critical situations (2.86), the fixation of value assets (3.21), company environment friendly advertising claims and practices between communication support (2,43), investment risk management (2.36) the game theory does not apply, according to the experts.

The experts were asked to identify the tactics used to make business decisions. It depends partly on the tactics, what position will be followed in the game. The experts were presented with the tactics` types (game character selection, negotiation, maneuvering):

- tactics in the fog (business subject is never sure of what is really going on, what are all the possible solutions, how the opponent perceives the situation, whatever is the opponent's opinion, what is the position of his competitors, etc.);
- tactics in dim conditions (company`s pricing, marketing, distribution, advertising and other strategies hiding from competitors, so that competitors would not use similar strategies);
- volume manipulative tactics (business company controls, i.e. reduces or increases the market release, demand, volume of goods sold; thus it can stop competitors from copying its products, retain its competitors access to the market, etc.);
- the added value of conservation tactics (for the company is not so important sales volume as much as it is important to ensure the quality of goods or services, thus creating a higher added value).

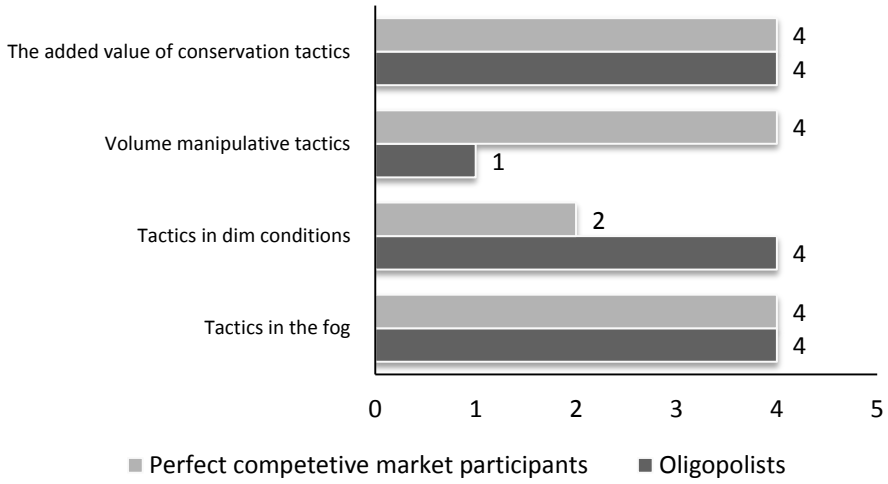

Figure 34. The selection of tactic types according to the competitive type, answers rate

Source: developed by the authors according to the expert assessment results.

What revealed the results? Both types of competitiveness, according to the experts, apply both tactical fog and added value of conservation tactics (see Figure 34). In the business world of oligopolists and perfect competitive market players one can never be sure of the decisions` outcome, to know the real situation of competitors, fully evaluate the behavior of competitors at the transaction`s success or failure. To the oligopolists` companies and perfect competitive market participants that seek long-term prospects in the market, it is important to ensure the quality and build a higher added value from their products. Only then one can expect a strengthening of competitive position against competitors and market penetration.

The results of the expert evaluation showed that the volume manipulative tactic is more applied in the perfect competitive market, when the tactic in dim conditions is used among oligopolists. These two differences are determined by the companies` capacity: being *large* in the market you can apply sophisticated pricing strategies to create a more expensive advertising and advertise more frequently. When you are *smaller*, you have to be flexible, produce what is ordered and the requested quantity. If it is too complicated, there are risks to lose the client and the market share.

It was interesting to follow how the experts` responses were divided estimating their share in the market with the common market (see Figures 35-36).

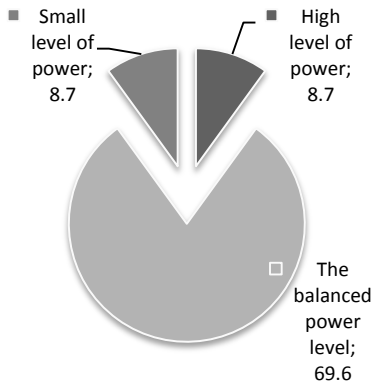

Figure 35. Responses to the question "How would you assess your company's market power?" (%)

Source: developed by the authors according to the expert assessment results.

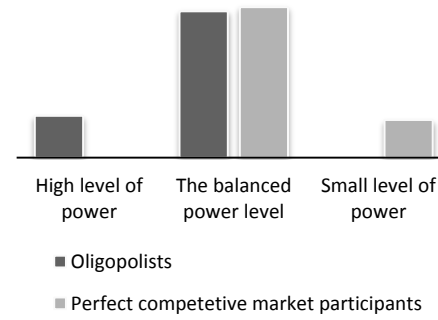

Figure 36. Responses to the question according to the competitive type "How would you assess your company's market power?" (%)

Source: developed by the authors according to the expert assessment results.

According to the results, it can be stated that both oligopolists (77.8 %) and the perfect competitive market representing experts (80 %) indicated that they had the balanced power level, which means that "I am the same as most of my opponents; I and my main opponents have the same power." Thus, when companies in the market consider themselves as a sufficient competitor to other companies, then the game theory is likely to occur in the negotiations, marketing campaigns, purchases, also when competing to get orders or to lure suppliers and so on. 22.22% of experts representing oligopolistic market indicated themselves as having a high level of power and that they are much stronger than their opponents, which allow them to impose their own interests. It is likely that these companies are dominant in their market. They have more opportunities to shift their actions which will bring higher perceived value. 20% of experts representing perfect competitive market referred themselves as small and too weak in the market, so unable to force their opponents to act according to their own interests. In this case, such type of players is waiting, when the major market participants will make a decision, so that their action plan would be adjusted to competitors' actions.

The executives` that represent businesses reflect on the wrong game. The conclusion – the negative experience makes us one step closer to success.

In the questionnaire the experts were asked to give their opinion on *whether the player who chooses the wrong game always experiences only the negative effects*?

> *The negative consequences today generate positive side effects for the future, because today`s unsuccessfully played game sets a precedent to win back in the near future. Former successful transactions` customers demonstrate at least a temporary loyalty and are more lenient examining the new terms of the transaction. It is also clear that it is difficult to predict in advance whether the selected game really is wrong. Companies may choose certain strategies in anticipation of no changes in the conditions, but the conditions can change unexpectedly (e.g. new laws related to the company may be accepted), and the eventual outcome can be positive. So the consequences will depend on the changing circumstances, which in the business world are constantly changing. For example, the situation due to extremely high speed (changes) in the telecommunications market may change faster than game will be completed. In exceptional cases, the negative profitability of the project can have a positive effect in the future. So to say, increasing the likelihood of getting another lucrative order from the same customer.*

Choosing the wrong game, you may mislead your opponents, making up false strategy`s impression, and this might be useful in the future. From the incorrect way of gaming one can gain useful experience, because under certain market conditions the chosen game strategy gives a negative result and may formulate a very clear list of errors that are needed to avoid the current situation. In addition, the incorrectly selected way of gaming can simulate other games, changing some game strategies, tactical decisions and factors. What is clear is that while the short-term incorrect game result is the loss of investment, customers and time, but from each failure it is possible to reach conclusions that will help in the future to choose the right game. The player can win the long run by properly analyzing and assessing the situation!

Another issue was used to purify the *consequences that can expect the player, who chose the wrong game in a specific conflict situation.*

It can be said that the consequences may be short-term and long-term. The short-term consequences are identified as: loss of customers, revenue loss and financial loss. To the long-term consequences attributed: reputation damage or even loss, loss of confidence in the company's production, deteriorated market image, which costs significantly more to restore it than to create a new label, lost relationships with businessmen, future partners and terminated supply chain. Perhaps the saddest consequence is to direct the actions of the competitors in an unfavorable direction to oneself, the destruction of the market and the nearest market expectations. **Even in this case, due to the high probability of loss, a businessman is forced to search for and find another way of gaming.**

It is not a secret that the vast majority of the public (not only Lithuanians), before purchasing goods or services pay great attention to the prices. The experts were asked to indicate what pricing strategy has been generally applicable to the represented company and to list factors determining the choice of price strategy and its necessity from the game theory`s point of view.

The experts were submitted the following pricing strategies:

- **skimming pricing strategy:** introducing a product on the market that is basically new, so as to maintain a sufficiently high level of prices in order to maximize profit;
- **entrenchment strategy:** the company establishes a relatively low cost to the released product in the market;
- **penetration strategy:** the company wants to enter a new market, that is why sets lower than average prices;

- **price and quality strategy:** the company maintains relatively high prices, in order to emphasize the product`s quality and exclusiveness;
- **competition oriented pricing strategy:** the company measures competitor`s similar products prices and sets the appropriate price;
- **differential pricing strategy:** the company sells the same products under different prices, even though their expenditure is similar;
- **Falling price strategy:** the company in order to survive in the market or trying to take a larger share of it, holds relatively low prices than its competitors;
- **discount pricing strategy:** the company sells larger quantities of the product, applying the additional discounts, thus maintaining the usual price and at the same time sells it cheaper.

The systematized results revealed (see Figure 37), that oligopolists` and perfect competitive market`s participants that choose to apply the discount pricing strategy, constitutes the same two competing markets representing experts number (50 %). The oligopolists particularly pay attention to the price set by their main competitor (62.5 % of the experts pointed out that they apply competition oriented pricing strategy).

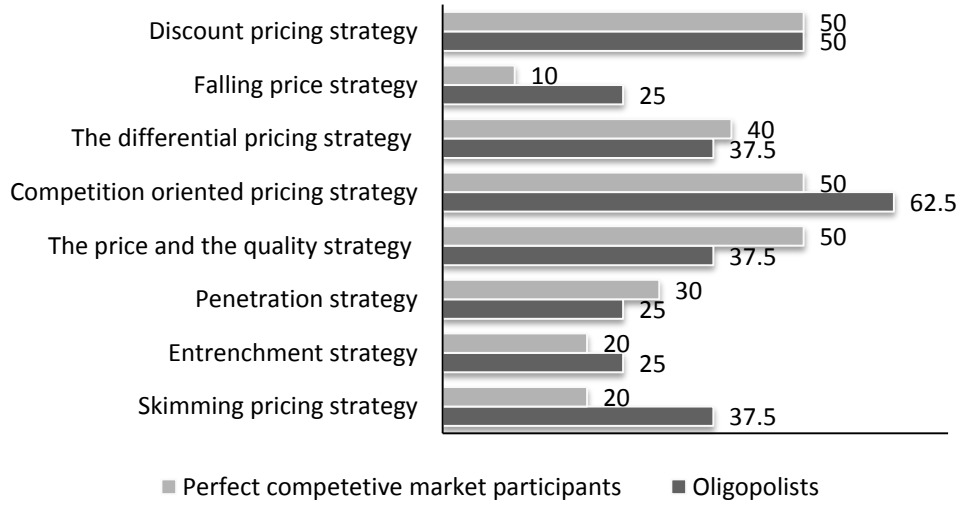

Figure 37. The pricing strategy for products / services according to the competitiveness types (%)

Source: developed by the authors according to the expert assessment results.

Meanwhile, the companies representing the perfect competition market type far less than oligopolists tend to choose *the price and the quality strategy* (this option noted 50 % of the experts from the perfect competitive market and 37.5 % from the oligopolistic market). This strategy`s choice among the perfect competitive market players is conditioned by the fact that the small market participants need exclusivity, which can be achieved through the price-quality ratio. The differential pricing strategy is also applied by both competitive market representatives, which means that the companies focus on separate segments, thus by differentiating prices can expect to earn higher profits. As one of the differences can be noted that oligopolists more frequently than the perfect competitive market companies adapt *skimming pricing strategy*, when the product / service is relatively new and from it can be made more profit. The most unpopular price strategy among both market representatives is identified the *falling price strategy*, because to maintain extremely low prices for a long period of time can the companies that are supported by the state.The following key factors that determine the price strategy are (see Figure 38): *the power level of the participating players* (mean value 4.40 points) and *other players' behavior and actions* (mean value 4.13 points). Thus, the first thing that is taken into consideration is what tactic and strategy determines the participant of the greater market power and how other market players react to the market price strategy. Less important factors that affect the price strategy`s type are *the gamers` negotiating power in certain games* (mean value of 3.8 points), *the gamer`s posture* (3.8 points), *the game`s pay back* (3.8 points), *the negotiation skills* (3.8 points) and *business financial condition* (3.53 points).

As can be seen, the second place by importance occupying factors are most associated with the negotiator's ability, i.e. as a game negotiator is able to show their bargaining power and skills. Of course, an important factor is the company`s financial situation, when choosing the appropriate pricing strategy. The insignificant factors, in order to apply the pricing strategy to the products or services, are regarded as existing experience in cartel agreements and optimistic and pessimistic scenarios for the game (3.13 and 3.40 points respectively). Cartel agreements` experience might be beneficial to other agreements, but not when setting prices. Scenarios, it does not matter - optimistic or pessimistic, can be very quickly rendered meaningless due to the constantly changing market conditions.

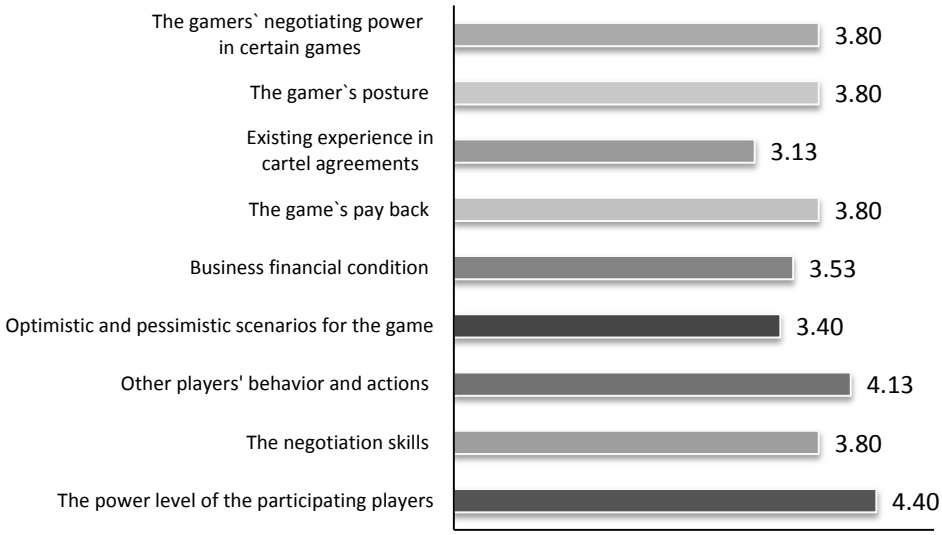

Figure 38. The factors that affect the selection of the pricing strategy, mean values ($p = 0.0001$; $W_a = 0.214$)

Source: developed by the authors according to the expert assessment results.

In another question, the experts had to indicate the game strategy, which generally apply in business. They were presented the possible game strategies with explanations:

- Zero-sum game: "If possible, I would like to destroy my competitors; if this is not possible, I would like to weaken them so that they would not pose a threat to me in the future" (the strict competitive or combatant approach).
- Non-cooperation games: "My competitors exist and they have a right to exist, because the market has many opportunities for everyone. However, I recognize that among us there will always be conflicts of interest. So I will act in a way that I can gain and keep the space, which is necessary for my survival and growth" (individualistic or militant approach).
- Cooperation games: "I need to survive, as my competitors need. Therefore, it should be possible to find the form of relationship that will allow us to coordinate our actions and make a decision, which would be best for all of us" (associative or cooperative approach).

The systematized results revealed (see Figure 39) that ***the cooperation games are the most popular among respondents*** (mean value equal to 4.16 points). The experts, who participated in the research, recognize that in each business niche there would always be competitors, with whom you need to maintain the relationship, at the best, acceptable to both parties. Lithuania is a small market, thus to cooperate and agree with the competitors is more efficient simply because that increases the availability to gain larger order, to fulfill the tasks in time and share the skills, that cannot be achieved only through the company`s intellectual and financial resources, discover foreign markets, establish new relations with foreign partners and so on.

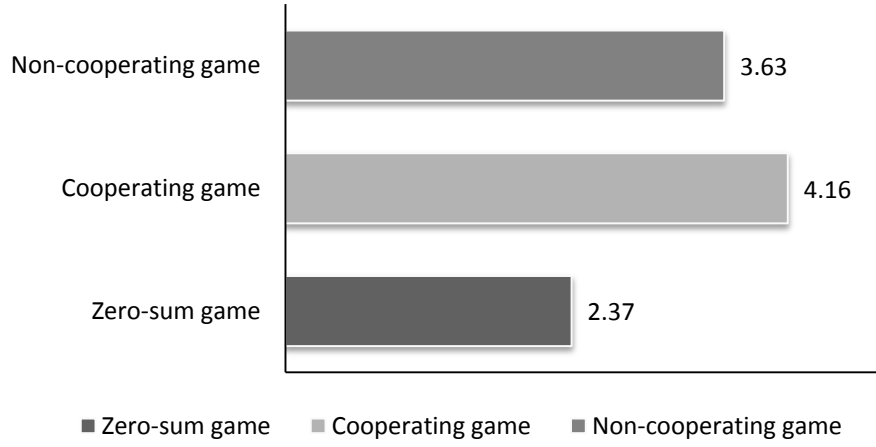

Figure 39. Answers` averages to the question: "Which game strategy is usually applied in your business practice?"

Source: developed by the authors according to the expert assessment results.

3.63 mean value is given to non-cooperating game. It is more common among market players who are financially stronger, that are less depended on the influence of others and has a well-established position in the market. The zero-sum game, in which is sought to destroy competitors or weaken them, so that their actions would not pose any threat to the future, is not applicable among experts (mean value 2.37 points).

In the game situations among oligopolistists and perfect competitive market companies noted only minor differences. 80 % of the perfect competitive market experts before making the decision in game follow the ***company`s summary results***,

such as balance sheets, profit and loss statement, cash flow statement and so on. While 67.7 % of oligopolists in game before making decisions prefer not only the company`s summary results, but also follow ***mathematical and economic calculations***. To the oligopolists it is easier to perform mathematical and economic calculations because of a larger human capital, held by higher material base and wider access to the services of outsourcing. Moral principles and subjective opinion in game are more common among oligopolists than perfect competitive market companies (see Figure 40). Meanwhile, the perfect competitive market representatives are more likely to make decisions under mutual agreement with colleagues (44.4 %). Again, this fact can be explained that while having the small market power, it is required to collaborate and cooperate with competitors, especially in while playing the game.

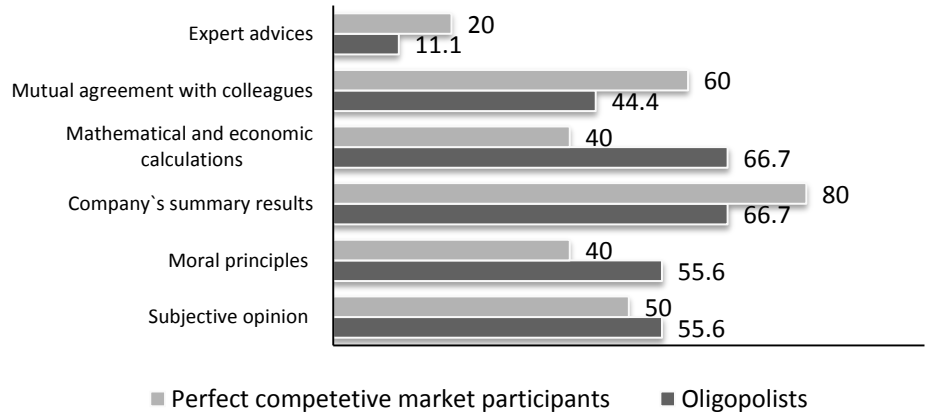

Figure 40. The factors determining decisions in game situations (%)

Source: developed by the authors according to the expert assessment results.

It is important to note that representatives of both types of competitive markets mostly participate in ***negotiations*** (see Figure 41), in slightly less repeatable and consistent game. Interestingly, the cartels are constituted only by participants of the perfect competitive market. Apparently, they mostly participate in public purchases (read more in section 3.2). In the intimidation oligopolistic companies are frequent participants, when a newcomer is choosing to go or not to go into a new market and the old-timer decides in response whether reduce prices or not. The cartels and the prisoner's dilemma are identified as the least used in game between the two types of participants in competitive markets.

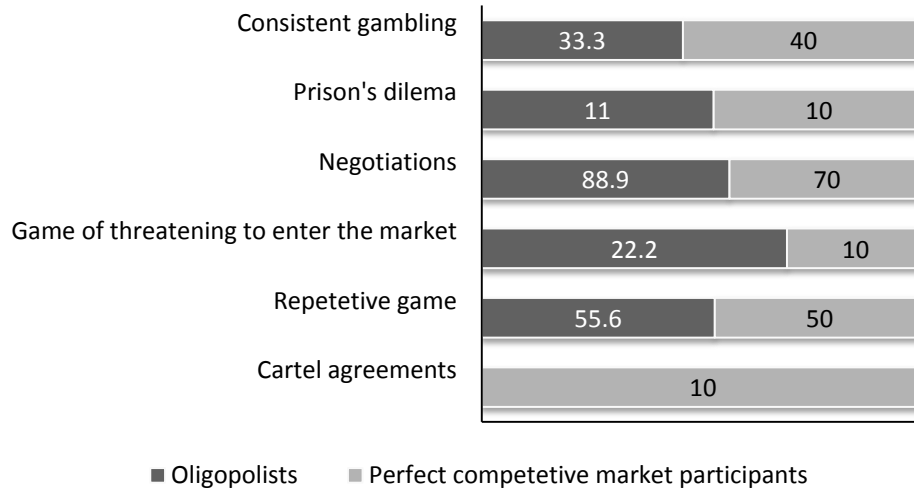

Figure 41. Participation in the games according to the market competitiveness (%)

Source: developed by the authors according to the expert assessment results.

Summing up the results of the expert assessments we can draw the following conclusions:

- The pilot research showed (telephone survey and a personal communication) that experts often apply game theory strategies, principles and tactics to business, but do not identify that this is a game strategy`s theoretical principles.
- After the identification of the business patterns in the Lithuanian market of oligopolists and perfect competitive market players in the game theory, their differences and similarities are systematized. The main differences, according to the oligopolists` opinion, are the ones that game theory can help to implement the strategic decision models; and the perfect competitive market players state that it can help to form relationships with other business entities. Another difference occurred during application of tactical strategies: tactics in dim conditions are more popular among oligopolists, while volume manipulative tactics are popular among the perfect competitive market players. The obtained results were affected by the fact that oligopolists have greater power in the market, so they can often ma-

nipulate their existing competitive advantages. Meanwhile, the perfect competitive market companies are small players, so they need to be more flexible responding to commercial offers, manipulate the offered volumes and not to reject offers. Of course, everything depends on the offer`s value and utility now and in the future. The similarities are related to the choice of pricing strategy using game theory principles (price discounts and the competition oriented pricing strategy are generally applicable to both market representatives). Another similarity is that before deciding whether to participate in a game the two markets` representatives assess their company's financial summary results.

- Negotiations and negotiation-related factors such as negotiation skills and negotiator`s power level are clearly the most widely distributed game theory elements among oligopolists and the perfect competitive market players. That is why the authors will continue to examine those factors in more detail.

4.2. Results of depth interview

This part was the most interesting for the authors since the facts have been stated, which seem to be known for everyone, however nobody talks out loud about them or writes about them. We are very thankful for the managers, who have agreed to participate in this research and reveal intriguing details about the negotiations and the art how to win those negotiations.

We provide the main ideas about the negotiations and how Game Theory turns into practice, which have been expressed during depth interview in a free language style. Have a useful reading!

Public relations and communication, law firm manager, who has work related experience for more than 10 years, states:

“Negotiations usually start before the announcement of a public contest, if you particpate in a contest for a project in a public sector. If the assessment criterion is “the lowest price” of announced contest, the company, which offers “the lowest price”, will be the winner. However, if a criterion is “the economic benefit”, usually the winning result is decided well in advance. The conditions of a contest are prepared in such way, that they match the characteristics of a specific provider. Logics and personal relationships (it is not a secret) help to win the orders for a company.

To get an order is the most difficult in negotiations. Often it is necessary to visit the company from which you expect to get an order for fifty or even hundred times a year. Other obstacles, which prevent from negotiating for an order are "intrusions" of a middle chain and constant risks, due to actions of Special Investigation Service of the Republic of Lithuania (SIS). The middle chain (department managers, supervisors and other) do not always provide the management with the correct information about current offer, execution of an order and limit the access to information. A businessman should be cautious about the actions of SIS, in order not to be accused of "making any impact".

Only one contest has been won without an agreement in advance within a decade, therefore the criterion of public contests "the lowest price" is a crime for a company, which will execute an order, and for the requestor, who will accept that offer. Quality lies somewhere on the other side".

A businessman, who represents automobile industry and has over 15 years of experience:

"It is very important to know and remember cultural differences, while negotiating with foreign business partners. We import cars from France to Lithuania, therefore it is essential to pay attention to their style of communication and their culture. Lunch for French is an exceptional thing, they have lunch from 1 to 4 pm, therefore no deals will be made during this time. French show no emotions in this business, they choose a client according to the principle of biggest price offered. No matter if you have been their client for the last five years, they will choose the one, they will be able to earn the most from.

Business success depends on honesty: you have to be honest for yourself, as a company, then you have to be honest for a client (if you wish that a client trusts in your offered products and becomes loyal to you), and finally you have to be honest for a partner. I trust in mathematics and numbers in negotiations only: I know how much I want and I can earn in advance. I am more flexible, when I know, that I have a client for a car, that I am going to acquire, then my communication manner becomes softer, I negotiate less for other conditions".

Company X Group supply manager, working in IT development area for more than 10 years, reveals:

"I participate in negotiations every day. The major thing in negotiations become satisfying special needs of clients and deadlines for supply. For example, a client wishes to acquire 500 units of goods, therefore it is necessary to find out what discount can be applied by the major producer. Most often our clients want goods strait away. One of the most essential things in negotiations is to identify precisely what does the client want from a company. Since all the clients of the company are

foreigners, it is very important to know their culture peculiarities. For example, Danes are crazy about an order, they are specific, all information provided about the product and delivery conditions should be described in detail for them, booking system should function very effectively. Whereas everything is opposite for French. French allow to organize work in a such way, that it would be convenient for our company, they are not picky. It is worth to mention, that if an order is not processed until 9 am, the reply from them can be received only at 5pm. French value lunch time a lot, lunch is sacred for them. It is very difficult to understand Estonians, they not only react to the requests very slowly, but they are also very relaxed. German are very responsible, accurate, they like to have everything being processed according to the plan, which is made in advance, and agreement conditions. Finns are the easiest to work with. Orders according to them have to be executed neatly, system should be closed on time, they are not so strict as Danes, they react to force majeure circumstances more flexible.

A very important aspect is transferring from a formal communication into a non-formal communication in negotiations, when you get to know your partner form a human side. Presents and greetings for holidays, common festivals and maintaining community feeling in trips make a big difference. The company maintains the principles, that bigger care shown from the producer's side gives more chances to cooperate successfully further. So, there is no single recipe in negotiations. The art of negotiations is affected by the cultural differences, also knowing your partner's priorities and other human factors, since personnel, who communicate with foreign partners, determine the number of orders and the duration of relationships".

Production of energy control devices, which maintain anti-corrosion repair, company manager, who has 8 years of experience:

"We apply Prisoner's dilemma in procurement. When a buying organization announces a contest, we agree with two or three companies from that region about the price in advance. It is possible to say, that we make a cartel agreement. Of course, the company, which sets the lowest price among us, wins the contest. Then secret agreements appear among the participants of a contest about sharing the tasks and money, execution of orders. Negotiations are conducted orally without signing any paper contracts. Sometimes it happens, that the participants cheat and do not keep to the conditions of a secret agreement, then a game is discontinued and a company is eliminated from a game, and there is no more chance that somebody will negotiate with such a company next time. Business does not like unreliable partners or competitors, that is why when somebody betrays a deal, consequences are obvious. When a company makes the price of goods and services in foreign markets, which is lower than the price in internal markets or the prime cost at the cost of company, unreliable player can be eliminated from a market forever.

The criterion "the lowest price" in the contests first of all means the work performed of low quality, and not equal competition conditions are applied for the participants of purchases. Of course, buying organization seeks to protect itself from undesirable and unprofessional companies, however, artificially created technical requirements (experience, the size of amount from conducted deals) limit competition.

Market in Lithuania is very small, that is why the number of orders is determined by personal relationships, acquaintances. I treat presents, festivals and trips as bribe, seeking to attract partner, supplier or competitor. All efforts to attract a partner to your side lead to bigger profit. You feel responsible for the employees of your company, paying salary on time, that is why in business like in war, all means are justified.

We are small in a market, that is why our competitive advantage is flexibility and possibility to get better conditions of an order. Talking about the success in business, the most important thing is to have a strategy, which is prepared in advanced, good team, which creates value added. If we talk about the success in negotiations, the most important aspect becomes reached compromise. If an order and meeting with a client is one-off, the price and other conditions of a deal will be more favourable to my business, however, if you know that you need to co-operate with a client more than a year (a multiple game), negotiations will be more favourable for the client. The most memorable process of negotiations was when there were no negotiations at all, the client wanted to execute an order urgently, therefore there was no pressure to reduce the named price".

When the respondent was asked to reveal, what practice in negotiations is with foreign partners, he answered without a doubt, that only positive, he often communicates with Swedish companies, they possess a very high work culture, order and responsible attitude towards an employee, they rise very high standards for work safety. Lithuania has many areas for improvement in this area.

Furniture production company manager, management experience is 8 years:

"Success for me is the achievement of expected result. I have participated in three public contests, where I won only one out of them with the help of personal relationships. There are talks about not equal competitive conditions for everyone in such contests, I have encountered monopoly power expressions in public procurement, when our state created exceptional conditions and support for certain companies to win, raising specific technical conditions, for example, furniture company should have employed prisoners, in order to win the contest. I often have to co-operate with bigger competitors, who act in furniture business. The main reasons for that are limited technological, human and material resources. I

would name adaptability to changing business conditions as my competitive advantage, since I started my business in 2008, during the crisis. It happens to meet foreign partners in negotiations, for example, Swedish. The most impressed idea from the negotiations with a Swedish manager was "I made my business though a feeling and will continue to make it this way". For me rationality takes over in negotiations, but emotions and feelings take also an important role in business".

Constructions product production sales department manager, experience 5 years:

"Success of negotiations, without any doubt, is expressed through the order in a written form. We are an oligopoly company and we know, that co-operation with competitors can strengthen our positions in a market and provide with necessary trust in business. We are superior to our competitors because we co-operate with businessmen from Scandinavian market. It is always beneficial to know the peculiarities of foreign countries in negotiations. For example, Norwegian or Swedish will not participate in any negotiations with you, if you do not have any positive recommendations from that country about your performed works or successful projects. Another advantage is selling a unique product together with its direct benefit.

I have noticed that public procurement is not always conducted in a transparent way, we do not take part in such contests since the value of an order is not adequate to the conditions of a contest. Lithuania is a small market, therefore a good name, which means quality, always brings benefit in negotiations".

A company manager for renewable electric energy resources, who has 5 years' experience:

"Intuition, feelings and emotions determine 50 % of successful deals in negotiations and business. Of course, specialists, who conduct trainings about negotiations, recommend to be prepared in advance and make an algorithm for negotiations, think of arguments "for" and "against". Maybe the most incredible is that you go into negotiations with the aim to get a specific result, however the practice shows, that the received result is never the one, which you have expected. At the beginning of negotiations, you scan your partner and later you understand how and in what way should the negotiations be conducted".

Manager of informal children education company, who has more than 3 years of experience, states:

"All business is based on emotions, belief or non-belief in what you do. I do not take part in negotiations, since it is old-fashioned and not transparent. A very strong factor turns on, while participating in negotiations, such as psychology, games start and sincerity disappears. Future business and future economic is

based on sincerity, and money comes through happiness. I see my competitors as my colleagues. I do not negotiate about the price with the suppliers or clients. Business will survive, if it is based on the principles of honesty, transparency and emotional assessment".

Authors' comment:

Interviews have revealed that there are imperfections in the mechanism of free market, especially in the contests of procurement. Procedures of procurement should assure equal competition conditions, however there are mistakes and small and medium business suffer from them. According to the representatives of business, the company, which offers the lowest price, makes suffer their employees, since next to the lowest price, very high technical specific requirements exist. In order to satisfy them, huge human and technological resources are necessary. What is more, the conditions of a contest often discriminate young businesses, which do not have more than 3-5 years of required experience in the market and their annual turnover does not satisfies the required amounts in the conditions of a contest.

It is possible to state, that Game Theory reflects the principle of negotiations: you are willing to make compromises and you are more flexible in those cases, when you know, that you will need to meet a partner, requestor or supplier and participate in common projects together not only this time, whereas if a game is of one-time only, you look for benefit only for yourself. Cartel agreements and secret talks are very common in procurement. Nash equilibrium appears there, when each participant goes into negotiations and keeps to a general agreement position, even knowing, that benefit will be lower, but guaranteed.

A very interesting phenomenon has been noticed in negotiations with foreign partners. Each nation has something specific, and only knowing these peculiarities, their culture and their style of communication, you can expect successful long-term relationships in business. Lithuanians do not have specific traditions in negotiations, this leads to adapting more to the specifics of other side of negotiations. It was identified during the research, that competitiveness conditions in business environment are not equal to all market participants. Most of the orders, business deals are made using personal acquaintances and connections, as a result, corruption elements can be noticed there. What is more, state showing an exceptional attention to the chosen company provides it with a monopoly power and this action breaches equal competitive opportunities for the companies, acting in the same area.

It is important to mention, that psychology of negotiations, even though is not acknowledged by the majority of managers, takes a very important part in negotiations as well as cartels or secret conversations. The art to affect a partner psychologically is also science.

4.3. Psychology of negotiations

Emperor had a dream, that all his teeth fell out. He invited a Wiseman, told his dream and asked him to explain what does it mean. A Wiseman listened and told: "Lord, you will encounter huge pain, you will lose all your relatives". The Wiseman was punished for his words and placed in a prison. Then emperor invited another Wiseman and told the same dream. The second Wiseman said: "My emperor, your empire will prosper for ages and you will outlive your relatives". That Wiseman was awarded for such meaning of the dream. So, the most important is HOW you say, not WHAT you say.

Psychology of negotiations is quite a new interdisciplinary area, connecting emotional motives and elements of negotiations all together. According to the scientists, who analyse psychology of negotiations, relationships during negotiations are similar to a war strategy in their order, which has a clear structure. Based on Malhotra, Bazerman (2008), psychological effect in negotiations is an effort to effect positively the point of view of other part towards a certain idea or offer, without changing the goals or intentions of that party. As Kacinskas states (2005), "using the method of negotiation analysis it is expected, that the players are rational and seek for their goal, however, they are not exactly that way, how the theory of traditional rational choice defines them or Game Theory, which examines the decision logics of two mutually dependent players. According to the method of negotiation analysis, both participating parties are equally rational in negotiations in the sense, that they are equally able to choose, what is the best for them, in comparison to other possible results, and also, that both parties equally know the process of negotiations and how the agreement is achieved. However, the majority of researchers admit, that the rationality of the parties is limited, and it means, that none of the parties can have a hundred percent correct information about the preferences of other party and knows not all, but only some of the alternatives, and that each of the parties seek to keep other party without being fully informed". (p. 35). In this case, ***emotions are applied in negotiations, the role of which has not been researched in detailed.***

Demonstrated emotions strongly effect the tactics of negotiations, the process of negotiations and the result of negotiations. Authors (Kopelman, Rossette, 2008; Olekalns, Druckman, 2015) have identified, that persons, who have shown *positive emotions* during the negotiations, such as *happiness*, were more willing to agree, than those, who have shown obvious dissatisfaction during the process of negotiations. Strategically demonstrated positive emotions increase the possibility to create common business relationships in the future among the participants of negotiations. Tools which explain, why the negotiators, who have better mood, are

more effective, are also identified as higher level of creativity, raising higher goals and concentrating on the interests of both parties. It is interesting, that positive power impact for negotiations foresee expected common profit and the characteristics of negotiators' communication and co-operation. In addition to that, more happy negotiators are more willing to co-operate. They suggest more attractive offers for other party of negotiations.

Demonstrating negative emotions can also be an effective strategy of negotiations. *Anger,* expressively demonstrated during negotiations can bring benefit, but only when the other party of negotiations does not have strong arguments or is not fully ready for the process of negotiations. (Kopelman, Rossette, 2008). It is also interesting, that only the negotiator, who has smaller power, allows dominating more powerful competitor only if the latter is angrier than his happy counterparty. Adam et. al. (2010) gives a very interesting example from real life about the use of negative emotions in negotiations (see example No. 4).

> ***Example No 4.*** *In early 1990 trade deficit in the U.S.A. with Japan reached almost 60 milliard dollars. President Bill Clinton, seeking to reduce deficit, negotiated for trade with Japan and hold to strong and aggressive politics. In February, 1994, during one of the leadership meetings with Prime Minister from Japan, Morihiro Hosokawa, Clinton used blunt speech with the aim to convince Japan to open their automobile, medical equipment and telecommunications markets. Even though Hosokawa encouraged Clinton to get rid of "anger and threatening", Clinton maintained his combative speech tone throughout the time of negotiations. After long hours of discussions, negotiations ended up in dead-end.*
>
> *Critics treated the art of Clinton's negotiations towards Japan as a total failure. Japanese openly disagreed with Clinton's confrontational attack and only after some time unwillingly provided minimal discounts.*

Couple of areas exist, where strategically demonstrated emotions, despite they are positive or negative, can make an impact to the process of negotiations: 1) to transmit, collect and process information; 2) as a mean to convince, which could be manipulated in negotiations, that other party responded in an expected manner, and without this mean, the other party would have behaved in a different way.

Despite whether the form of information exchange or manipulation tactics is chosen, if demonstrated emotions breach cultural values and norms, such strategy

will not only be ineffective, but will also damage social relationships, followed by the processes and results of negotiations.

The participants of depth interview, who have experience with foreign partners in negotiations, have identified, that it is extremely important to know cultural differences, if you seek for the effective end of negotiation process. Culture consists of mutual interacted models or dimensions, which are expressed through a unique social identity and is shared with at least two people. Culture is a specific feature of a social group, which stands out as values and norms of common group members. These features make stand out social group from other groups. Values reflect what is important for a person, whereas norms show respective behaviour. Values and norms foresee the choices of internal cultural group members and impact conditions of negotiations, emotions, motivation and strategy. Due to different values and norms, people from different countries conduct negotiations differently.

Example No. 4 has shown rising difficulties in negotiations between the countries, which have originated from different cultures. In fact, the key element of this example is different attitude of American President and Japanese Prime Minister towards the expressions of anger: Hosokawa has asked "to leave anger behind the doors", negative Japanese reaction towards Clinton's behaviour shows, that anger is perceived as not an appropriate tone of negotiations in East Asia countries, it also may be a *consistent strategy,* which helps not to give up and not to allow winning for counterparties. In a general meaning, the expression of anger is an effective strategy of negotiations, since bigger discounts can be received through anger in comparison to other emotions, such as happiness or total elimination of emotions. The results have shown (Adam et. al., 2010), that it is more difficult to understand angry negotiators, that is why their offered price is usually higher than other negotiators. These features should be as a warning sign, that a deal can have negative consequences (for example, negotiations may end up in dead-end), unless certain discounts will be provided during a deal. According to Olekalns, Druckman (2015), constantly demonstrated anger, as tactical expression, allows getting bigger discounts from the opponents. What is more, anger is the most effective in negotiations, when pressure to end up a deal is made and it can create fear. What connection does exist between anger and fear? When a negotiator expresses anger, worry is created for other party, whether payments or exchange of the negotiation objects will be processed.

Going back to the cultural differences, the researches of social psychology have revealed, that demonstrated rules or norms, which are expressed with the help of emotions, differ a lot among the countries. Ekman (1972), Friesen (1972) have conducted an experiment, where Japanese and Americans had to sit in one room

and watch a video, which created stress, and express their negative emotions, such as disgust or anger. Even though the experiment was executed in one room, Japanese participants were hiding their negative emotions under smiles, whereas Americans did not hide their anger. So, the expression of anger can be totally accepted in Western culture, but not in Eastern Asia countries.

Cultural differences, such as vertical or horizontal cultures show, how people process social information. Vertical culture is characterised by a social hierarchy and respect towards a specific status; horizontal culture is denoted according to social equality and low power distance. Negotiators from these two types of cultures interpret and use power differently. Power distance is higher in vertical collective cultures and lower in horizontal individualistic cultures. People from vertical high power distance countries such as China, Japan or Turkey, are more willing to include their management into a conflict solving process, rather than trust on their own experience, colleagues or peers only. What is more, such people are less willing to argue or negotiate with their manager, however, when the negotiations are with people, who are in a lower hierarchy position, they reveal who has a higher status.

Impact of culture is also seen when expressing emotions. Among the countries of independent cultures, such as the U.S.A., ideal cognition of yourself is treated as a positive and unique trait by others, independence and self-confidence is associated with positive feelings and high self-esteem. Feelings and expression of happiness are essential in social interactions. Among the countries of dependent cultures, such as Japan, happiness is associated with reasoning and trust in correct relationships and also positive self-assessment. Talking about the intensiveness of emotions, Japanese respondents were more calm when showing positive or negative emotions. The difference of expressing emotions can be also illustrated, when Japanese respondents were ignorant towards booking a hotel or receiving cancellation of a booking (Li, Roloff, 2006).

Cultural differences also explain, why do we treat one and the same thing differently. Let us take an example of individual and collective cultures. We can assume, that comparing American negotiators (individualistic, independent culture) with Chinese (collective culture of clearly assumed mutual dependency) negotiators, who will remain calm without showing their real emotions, which they feel during negotiations, and will minimally go into a conflict seeking to maintain good relationships with their opponents. Differentiating cultures into independent and dependent, we can assume, that the behaviour of negotiations is effected by social relationships, which exist between negotiators. More competitive and aggressive negotiators should be appointed for an independent culture, whereas more communicative and seeking for compromises negotiators should represent the culture of mutual dependency. Having such information, we can guess how Chinese or

American will behave in negotiations, how they will show their positive or negative emotions and of course, how they will interpret the behaviour of other party. Are there any misleading interpretations, trying to find out what do the opponents what to say in their behaviour or emotions? If yes, then what are the consequences of such negotiations? Of course, in order to answer the named questions, it is necessary to understand and have general knowledge about psychology of culture. What is more, a negotiator must be able to recognize this process and accept it properly, interpret and create specific meanings of cultural environment, especially when strategic behaviour and motivation are interrelated.

The behaviour of negotiators from different regions and cultures is presented in example 5.

Example No 5. *American approaches to negotiations*

American negotiators are willing to trust in their individual values, since they treat themselves and others as independent and self-confident individuals. Of course, this does not mean that they do not consult or talk about decisions, but the tendency is that you will see them more separately than in a team. American negotiator is willing:

- *to be very competitive in negotiations, also in cautious or unreal offer;*
- *to be energetic, confidential and persistent; he enjoys defending his positions and sees all the things as multi-purpose, he likes talking about wide range of idea application;*
- *concentrates only on one problem during negotiations;*
- *likes certainty and being reserved more than uncertainty and being open.*

Do these definitions fit for everyone? Of course, not, it depends a lot on the character traits of a particular person, area he represents, context of negotiations (political, business, family, community and other). Strategies change depending on the context of negotiations and, of course, on other factors.

African approaches to negotiations

Most of Africans have a local system of conflict solving, which has been formed in the past and despite rapidly changing environment, has survived until now. This system is based on a specific point of view towards negotiations, where the role of an older person, according to age, is valued very much, also family connections and the structure of a local community. For example, African social control is still based on a belief, that dead ancestors can impact the lives of those, who are alive, therefore official laws and common order is based on this principle. Negotiations are conducted based on a

social hierarchy, and its set roles. For example, a word of an old man is always the most important, and a woman during a conflict with a man always apologizes and makes ritual meals, as a symbol of desired harmony.

Social hierarchy is the most important in Nigeria, that is why every single individual is assigned to a respective group. In order to assure success of negotiations, negotiators must not be against the power of ancestors, otherwise curse may appear in the future. The goal of each process, no matter if it is formal or non-formal, is to get a positive result, without any rancour or resentment. Elderly people have bigger power and if they get involved into the negotiations or conflicts, their word is very respected. Such huge respect comes from a belief, that the elderly have an access to supernatural powers, which in case of good actions, protect biofields and in case of bad actions, bring personal misfortune. Hierarchy and order are very important during the process of negotiations in Africa.

Japanese approaches to negotiations

Legends are created about Japanese point of view towards the negotiations. Japanese communication is based on group concentration towards a goal, mutual interdependency and hierarchy. These values are expressed through group members' perception of needs and respect towards higher status in negotiations. Japanese negotiators are famous for politeness in creating relationships through shown attention and usage of indirect power. Direct communication "eye to eye" is important for Japanese and this confirms, that politeness is also important for them, seeking to avoid misunderstandings, especially when communicating and negotiating in digital space. They are willing to use their power in reserved and indirect ways, which reflect their wishes and the need for harmony. During the researches Japanese negotiators have revealed less information about themselves and their goals, then French or American. Japanese negotiators are willing to use less words of direct meaning and are focused more on making relationships before negotiations. They make less procedural offers than Americans.

European approaches to negotiations

European style of negotiations varies depending on the region, ethnicity, language and other contextual factors. It was identified during one study, that French tend to be very aggressive negotiators, they use threatening, warnings, and interrupt the opponents, in order to achieve their goals. German and British negotiators were averagely aggressive in the same research. Lithuanians often adapt to a situation, listen to an opponent. The most important aspects for them are money and achieved consensus in the process.

Negotiators differ a lot in their style of persuasion. Emotional sensitivity is not very valuable in America, deals can be simple and impersonal. When a conflict rises in America, complaints are based on logics and facts only. Japanese negotiators value emotional sensitivity a lot, and they are willing to hide emotions under calm face. Latin American negotiators are not similar to Japanese in emotional sensitivity and present their ideas emotionally. Arab negotiators can appeal to emotions and subjective feelings in order to affect the opponents. Russians, on the contrary, are willing to pay attention to principles, which are like an ideal, and try to pay other parties' attention to them.

Summarising, can be stated, that it is complicated to guess and assess the behaviour of negotiators, paying attention to different cultures, especially, when cultures constantly affect each other and change in a global world, and their structure influences people' behaviour in various ways. Another obstacle in foreseeing the circumstances of negotiations is that, without culture, each organization has its own style of business culture and traditions. The tendencies of negotiators behaviour, provided in example no. 5, are more general and it does not necessarily mean, that the negotiators from the named nations will behave the way they are described. LeBaron (2003) provides a table, where the characteristics of negotiators are grouped according to their importance (see table 47):

Table 47. Characteristics of negotiators according to nationality

American negotiators	Japanese negotiators	Chinese negotiators (Taiwan)	Brazilian negotiators
Preparation and planning skill	Dedication to job	Persistence and determination	Preparation and planning skill
Thinking under pressure	Perceive and exploit power	Win respect and confidence	Thinking under pressure
Judgement and intelligence	Win respect and confidence	Preparation and planning skill	Judgment and intelligence
Verbal expressiveness	Integrity	Product knowledge	Verbal expressiveness
Product knowledge	Demonstrate listening skill	Interesting	Product knowledge
Perceive and exploit power	Broad perspective	Judgment and intelligence	Perceive and exploit power
Integrity	Verbal expressiveness		Competitiveness

Source: LeBaron, 2003.

As seen from the table, Brazilians and Americans were almost identical in the characteristics they have identified according to importance, except for the final category. Japanese tended to emphasize an interpersonal negotiation style, stress-

ing verbal expressiveness and listening ability, while American and Brazilian negotiators focused more on verbal abilities, planning and judgement. It is very important for Chinese from Taiwan, that a negotiator is an interesting person, who shows persistence and determination in negotiation process.

What s more, it is important to know where to direct anger: towards a personal object or an object of negotiations. Specialists of negotiations art encourage negotiator to concentrate on solving problem and direct emotions not towards a person. This encouragement is correct, since an emotion is directed towards a task, not towards a person, will give more effective results of negotiations. The same situation we have with negative emotions: if they will not be directed towards a competitor, you will get more discounts regarding the questions of negotiations from the opponent.

When is it worth to get angry? Or when is it worth paying your employee for demonstrated anger? The answer is very simple: when both parties are independent, and anger is viewed as a tool for strategic expression, or when anger is justified.

One more emotion, which should be controlled during the process of negotiations is *disappointment*. Disappointment as a separate emotion creates only a feeling of guilt for other party and guilt encourages co-operation (Olekalns, Druckman, 2015).

As seen from conducted researches of authors, negotiators are advised not to become emotional and hold their emotions as much as possible (folk wisdom also agrees with this!), however, the authors provide a totally opposite opinion: emotions, regardless they are positive or negative, can help to achieve the goals of negotiations. Hidden negative emotions enter stem cells and remain there, therefore when communicating with an opponent, negotiator should use energy additionally, as a result, physiological agitation (concern) remains and the opponent feels it. It is obvious, why overviewed literature advices to stay away from emotions. First of all, being emotional means to become dependent and refuse rationality. Emotions, especially in our society are associated with weakness, loss of control and avoiding rational expectations. Emotionality is person's impulsiveness and short-sightedness. Secondly, emotions can make people worry, whereas having a mask of friendliness or collegiality can protect you from emotionally based dialogue. Thirdly, many negotiators lack of words, which would clearly define emotional experience, therefore they concentrate on such things, as sharing property or distributing payments instead. It is more simple to discuss the essential questions in business meetings for most people, than such abstract topics, as worry about the future of a deal or humiliation feeling for unsuitable conditions and other.

So, why is it important not to be ashamed about your emotionality and not to hide it under many masks?

- Emotions affect our ability to achieve the goals of negotiations. The results of depth interview have shown, that it is still thought, that there is no place for emotions in negotiations. However, people live emotions all the time and they can affect efforts to seek for the goals of negotiations.
- Emotions are means of communication, directly associated with solving problems. Parties cannot negotiate well/ talk until the moment, when they understand, that negotiations have started. In order to achieve goals, parties have to care about each other or they have to care about the same problem and this always creates emotions.

Why is it necessary to care about emotions, seeking for the goals of negotiations? First of all, about two desired goals, when parties interact: *affective and instrumental satisfaction* (Shapiro, 2002). The ability to recognize, express and use your emotions while negotiating, increases the possibility to achieve these goals.

Emotional satisfaction is one of the types of satisfaction, experienced during negotiations. Am I happy, sad or maybe frustrated due to my feelings? Emotional satisfaction means, that I am satisfied, because I perceive my emotions. We will provide you with an example of emotional satisfaction: participating in negotiations we perceive, that one party tests another party, showing adequate respect. If one party respects and values another party, then they feel increased enthusiasm in negotiations. On the contrary, if we feel frustration in negotiations, because we were offended or deluded by other party, we will not get emotional satisfaction. It means, that the end of negotiations will not be as we expected.

The second goal is connected with instrumental satisfaction, which is experienced, when the main requirements of negotiations are implemented. If negotiators from two opposing companies meet each other ten times in various meetings and these encounters bring them good emotions, however, they do not find an effective way to satisfy their interests, those meetings can be treated as effective and successful, but they are called instrumental failure. Instrumental satisfaction means, that the parties can effectively work and agree about the things, which they seek for (Shapiro, 2002).

Summary: *in negotiations, as in any other situation, clear mind should dominate and based on it rational decisions should be made and expected result could be achieved, however, human beings cannot avoid emotionality, that is why it is necessary to recognize emotions as an important and respectful part of process in a business game. Of course, to answer the question, how to learn understanding emotions, reasonably accept them and use, is not the purpose of this book.*

4.4. Transparency of business

4.4.1 Concept of business transparency

To analyse this topic was chosen not accidentally, since the results of the interview have shown, that not clear deals and agreements exist in business, seeking to get orders and win contests. In the conditions of contemporary capitalism, the need for bigger transparency of business has become one of the areas, where journalists, economists and businessmen talk a lot about and view it as a mean of healing business from corruption. (das Neves, Vaccaro, 2012; Doorey, 2011; Frynas, 2010; Lazarus, McManus, 2006; Makary, 2012; McKay, 2008 and other). Huge attention towards the increase of business transparency is imposed due to the reason, that the lack of transparency in business reduces trust, that companies can act freely, without any legal, social, ethical, economic and environment restrictions. It seems that if no restrictions were applied to business, businessmen did whatever they wanted, and this would have increased overall scepticism about the existence of transparent economic activity. What is more, internal and external subjects, connected with business, gain more power due to communicational technology progress: as noted by Bennis et al. (2008), it is easy to be always online, meaning, to follow news always. What is more, high shadow economy level, especially in less developed countries, including Lithuania, creates an impression, that a big part of business deals is conducted behind the limits of legal economics. Due to the named reasons, all subjects, which can make impact to business activity or are affected by it, express concerns, that it is not possible to trust quite a big number of business companies. So, one of the most important social problems become the aim to reduce overall scepticism about not transparent business activity (Darke, Ritchie, 2007).

Paying attention to the named circumstances, the increase of business transparency could benefit as a tool, allowing to improve business management activity and increase trust of society in business. Ethical behaviour of any subject (including business company) is assessed based on common opinion about what is treated as right and wrong (Parris et al., 2016). This ethical assessment is based on values, which are introduced in families, customs and culture. It is noted, that ethical behaviour assessment can depend on a specific behaviour of a subject (his personal features, relationship with other people, decisions made) and on the type of situation (assessing personal, professional or cultural situation) (Hunt, Vitell, 2006).

Declared values of business company or organizations as a private person, give a message to society about what the company or organization is, whether they be-

have ethically correct or incorrect and how to behave with them. If a company implements, what it declares, the chosen ethical directions of a company reflect in all its areas (AMA, 2010; WOMMA, 2010), meaning that if the values of a company reflect in its culture, activity processes, communication style, a message is transferred to the society, that the company is responsible and is able to improve relationships with other subjects, if necessary.

Until now the efforts of business companies to increase transparency were quite random; talks about the increase of transparency were more responsive reaction towards the pressure of society or the aim to create favourable reputation (Cutler, 2008; Klara, 2010). Trying to prove, that a company acts transparent, some companies have established codes of ethics, which have improved ethical business decision making. However, one measure is not effective enough until the whole complex of measures is created.

Before analysing the mechanisms of transparency, consequences and impact, let us define, what transparency is. Quite a big variety of definitions about transparency exist in scientific and economic literature, however one precise definition is not present (Baker, 2008; Bird, Wang, 2011; Cornand, Heinemann, 2008; Eggert, Helm, 2003; Hofstede, 2003; Hultman, Axelsson, 2007; Jahansoozi, 2006; Vaccaro, 2012; Vaccaro, Sison, 2011; Warren et al., 2012). In the majority part of studies, which analyse the problems of business transparency, transparency is defined as openness of business organization, wish to share information with internal and external subjects or focus on other subjects. The analysis of scientific literature allowed to systemize various concepts of transparency, provided by different researchers and analysts (see Table 48).

Table 48. Variety of transparency conceptions

Direction	Conception	Author(s), year
Openness	Transparency in organization	Bird, Wang, 2011; Jahansoozi, 2006
	Provide and get feedback	Vogelgesang, Lester, 2009
	Straightforwardness, especially identifying the reasons and motives of decisions	Drew et al., 2004; Pirson, Malhotra, 2008; Vogelgesang, Lester, 2009
Sharing information	Sharing what is usually not shared	Eggert, Helm, 2003; Hultman, Axelsson, 2007
	Open and free sharing of information	Baker, 2008; Hofstede, 2003; Vaccaro, 2012; Vaccaro, Sison, 2011

Direction	Conception	Author(s), year
	Being informed	Eggert, Helm, 2003
	Free and voluntary sharing of information	Baker, 2008
Orientation to other subjects	Ability to understand the intentions and goals of other subjects	Cornand, Heinemann, 2008
	Consumers' ability to identify possible cheating of business companies	Warren et al., 2012
	Having general understanding	Beulens et al., 2005; Hofstede, 2003

Source: compiled by the authors.

As seen from Table 48, providing and receiving feedback is stressed while interpreting transparency as openness of business organization, and clear arrangement of reasons and motives, while making decisions. In the context of sharing information, transparency can be perceived as open and free transmission of information for internal and external subjects, sharing possessed resources, experience, other values and being informed. Finally, orientation towards other business subjects, transparency can mean the ability to understand the goals of other subjects and intentions, having mutual understanding with other subjects and avoiding cheating. However, it is noticed, that the concepts of transparency are often abstract, many ambiguities are present, and this rises a problem, when trying to assess transparency in business. What is more, as Parris et al. (2016) state, that attention is rarely paid towards the aspect of relationship quality, when seeking to interpret transparency, which is necessary in order to explain transparency, as the background and motive for business activity, which encourages to move ahead. Table 49 provides with the criteria, based on which the quality of completeness for various concepts is assessed.

Based on the criteria, defined in Table 49, we can make a conclusion, that the concept of transparency as openness in an organization is not very qualitative, since the features of the object (transparency) is not reflected in it, no application indications (to whom and how) are described. After the analysis of completeness for various transparency concepts according to criteria, listed in Table 49, authors Parris et al. (2016) have identified, that the definition, which satisfies all criteria the best, is the following: "transparency is consumers' ability to identify possible cheating of a business company" (Warren et al., 2012, p. 123), even though it does not cover such important aspects of transparency as openness or sharing infor-

mation. Another qualitative definition of transparency is: "transparency is individuals' wish to assess the level, through which their internal status and intentions are understood for an external observer" (Garcia, 2002, p. 133). The latter definition of transparency, according to Parris et al. (2016), reflects the type of transparency phenomenon.

Table 49. Quality completeness assessment criteria for various concepts

Criterion	Definition
Object of definition	Definition reflects the main object of phenomenon precisely
Features of object	Definition explains what is object (idea, feeling, perception, action or result) and reflects its main features (structure, speed, possibilities, abilities)
Features of entirety	Definition explains, who the object is associated with (certain person, connections, group, team, network, organization)
Accuracy of concept	Definition is provided without using examples or words creating uncertainty, such as "is similar to", is connected with", "is defined as". What is more, formulating definition, the focus is placed on what is the phenomenon, but not on its reasons or consequences
Clarity of concept	Definition is brief and clear

Source: compiled by the authors with the reference to Parris et al., 2016, p. 213.

As seen from the analysis of provided definitions, it is difficult to find clear and brief definitions of transparency in literature, and the ones which are found, do not fully cover all the features of phenomenon, object and its connection with other objects. This creates problems, how to assess transparency in business more precisely and based on what to assess the connections between business companies and other subjects, whether they are transparent or not. In order to show, that companies act transparent, but without realising what it is, the companies often create various strategies, which are not clearly defined and are silly, they are hard to implement and difficult to understand for others. Due to this reason, communication problems often rise between a company and the subjects, interested in its activity (Tellings, 2006). The lack of transparency can create various moral dilemmas between the supplier and the seller, despite their close relationship (Roloff, Aßländer, 2010). In order to help assessing transparency in business more precisely, Parris et al. (2016) offer the following definition, which in his opinion, satisfies all criteria and defines transparency the most comprehensive:

"transparency is the scale, through which a subject perceives, that business organization provides him with the possibilities to get information about itself". Based on authors' opinion, this definition creates a background for academic and business analysts to develop the theory of transparency further, research its reasons and consequences.

> *Transparency and trust are reason and consequence, in other words, "what you do to me, I do the same to you"*

Transparency in scientific literature is mostly researched within marketing, organization behaviour, and political science areas. Big part of transparency researches analyse the type of transparency though conceptual or qualitative meaning. Transparency is aimed to understand in researches, as a separate area of studies. It is noted, that transparency is necessary, in order to create a feeling of trust and accountability between a business company and internal and external subjects, which are related. Trust means, that a subject wants to accept the risks, associated with actions, which he performs towards other subject (Stanley et al., 2005). In other words, subject is taking risk to have deals with other subject, if he trusts in him. For example, employees can trust in an organization, if information is shared there, learning opportunities are created, communication is open. According to Palanski et al. (2011), a subject wants to behave transparent, when he feels trust from other subjects and, when other subjects do not misuse their power, which is gained with the help of higher amount of knowledge. So, not only employees can trust in a company; a company must trust in employees.

Transparency in business means, that a company is ready to take additional steps in order to inform quite well the subjects, connected with its activity, about concerned questions (for example, shareholders should get precise and timely information about profit, consumers should get information about goods or services, suppliers should get information about payment conditions and other). Since the activity of any company relates to many subjects (employees, consumers, partners, shareholders), giving out information provides benefit for them. It means, transparency provides benefit for employees, consumers, partners and the whole society. What is more, transparency between work teams or companies affect systematically not only the level of trust for a certain company, but also the general level of trust in each other within society (Blomgren, Sundén, 2008; Brown, Michael, 2002).

Benefit, received from transparency for business companies is the trust of society in them. Trust is a belief in credibility and honesty of a trade partner (Ahearne et al., 2007; Eisingerich, Bell, 2008; Urban et al., 2009; Yim et al., 2008). There are

discussions between business leaders and followers about the trust and about the benefit, that is brought to business by transparency (Vogelgesang, Lester, 2009), companies and customers of their products or services (Beulens et al., 2005; Chua et al., 2012; Jahansoozi, 2006) and Government institutions and their employees (Halachmi, Greiling, 2013). Transparency as the phenomenon of trust, can be understood, after having analysed its reasons, type and impact. In contemporary business, the widest applied models were created by Mayer et al. (1995) and later they were developed by Schoorman et al. (2007). Mayer et al. (1995) paid the biggest attention to the type of interpersonal trust. Schoorman et al. (2007) has admitted, that the initial his and his colleagues' goal was to develop the theory of general trust, applying it in the analysis of trust between business companies. Authors have suggested a model, where the concepts of trust and willingness to trust are associated with the subject's wish to take risks or wish to be vulnerable. A wish to be vulnerable is based on a person's analysis of major costs/benefit, an assumption is made, that if potential benefit is perceived from taken risks outbalance potential costs, then a person is willing to take risks and be vulnerable and opposite. According to Mayer et al. (1995) and Schoorman et al. (2007), a person or a business corporation are treated as reliable, based on favourable assessment of these three dimensions:

- Ability;
- Goodwill;
- Honesty.

Commenting the importance of the named dimensions in forming transparency, Schoorman et al. (2007) write: "The ability is such skills, competencies and characteristics, which allow a subject to make impact on other subjects in a specific area" (p. 717). For example, we will order furniture from furniture manufacturer, whose skills and competencies we trust, and if this manufacturer provides us with an offer that we agree with, it means, that his abilities allow him to make impact into our decisions within furniture manufacturing area. So, the abilities are closely connected with subject's competence and professionalism. Goodwill is denoted as a degree, through which a subject wants to do good for a person he trusts, despite selfish profit motives (Schoorman et al., 2007). Based on this definition, it is possible to state, that the definition of good willingness is close to the definitions of altruism and loyalty. Finally, honesty means person's perception, that a subject he trusts, keeps to the principles, which are acceptable for that person (Schoorman et al., 2007). So, if a person, is not willing to trust other subject and perceives other subject as the one, who has too little abilities, goodwill and honesty, it will be difficult for both parties to create connections based on trust. While the connections are at the initial stage, one of the most important factors to strengthen them is the

creation of trust. This means, that subjects must demonstrate honesty towards each other.

As it was mentioned earlier, transparency helps to create trust and vice versa. However, is it enough only transparency to make complete relationship between the subjects? The wish of a company to share information is necessary, however it is not the only condition for the creation of trust. Let us imagine, that a new business company tries to sell a new service on a market. Before deciding to use this new service, the consumers will consider, whether the company is able to provide quality service, whether it has enough experience in this area. If the answers to these questions are negative, the consumers will not be taking risks to use the services of that company, like investors will not be willing to invest into this company. Also, the questions will rise regarding goodwill and honesty of this company: the consumers will be interested whether the company cares about their needs, whether the services are provided honestly and the price is not too high, seeking to increase profit. For example, if a company revealing a new mission, focuses on the maximisation of investors' return, such position can put off a consumer, since nothing is said about the aim to satisfy a consumer's needs in the mission of a company and the consumers can doubt about goodwill of a company. Another example, when a customer heard from other sources that the suppliers were not able to deliver goods on time, can rise reasonable doubts about suppliers' honesty, unless a consumer needed goods so much, that he would be willing to sign off a contract anyway, taking risks of late delivery for himself.

As seen from the named examples, transparency is directly connected with other three factors of trust: ability, goodwill and honesty. Trust and distrust are incompatible with each other. In other words, distrust is absence of trust (Schoorman et al., 2007). That is why assessing communication of a company, first of all, attention should be paid to whether a company is able to provide promised goods or services. If an investor decides that the company he is interested in, has no abilities to do it, and potential risk of financial losses is bigger, when investing in such company, rather than potential return, then this investor will be willing to trust other company and invest there. In other words, the lack of trust in the abilities of a company put off internal and external subjects from any relationships with a company. Talking about the investment, it is said, that an investor does not trust in the abilities of a company to work effectively. Distrust can also be based on doubts about goodwill of a company. For example, if the employees think, that the initial goal of company managers is to exploit them, they will start distrust in management. Of course, employees may believe, that the managers of a company have the abilities to behave correctly with them, however, trust will be questioned, if they think that the managers do not show goodwill for their employees. The same tendency is applied in connections between companies and consumers:

if the consumers believe, that a company has the abilities to produce quality product, however, through the course of business, it will start using cheaper material and provide the products of a lower quality on the market for the same price, the consumers will rise questions whether the company has goodwill and based on it distrust can grow. Moreover, it is likely, that such loss of trust will have a long-term negative impact towards the activity of business: once trust is lost, consumers will get it back unlikely, therefore the goods of such company will be poorly purchased for a long time. To violate the background of trust can the incompatibility of declared values of a company with their practice. According to Mayer et al. (1995), a company is treated as trustworthy, when other subjects believe, that it keeps to certain ethical principles. If it is noted, that these ethical principles are violated in practical activity, it is assumed, that the company lacks honesty.

Summary: *ethical and moral commitments are important for many institutional subjects (including business companies), which relate to people, planet and profit. Social responsibility, persistence and profitability are essential ethical principles, according to which all activity of a company is assessed, whether business is responsible or irresponsible. Inability to conduct responsible business impacts a perception, that a company is not worth of trust and thinking that business of a company is not responsible, makes a very damaging impact. Therefore, attention to people, planet and profit and creating responsible business are the key elements for developing employee's loyalty, consumers' loyalty and seeking for an effective daily activity and long-term persistence in business.*

Benefit of transparency. We have covered the reasons, actions and consequences of business transparency in detail earlier. Let us analyse wat benefit can business transparency bring to different subjects. According to Parris et al. (2016), the practice of transparent and socially responsible business can have positive impact towards employees, consumers, partners, the company itself and all society.

Employees' benefit. Transparent organizations are open for sharing information between departments, work teams, also between vertical and horizontal levels of business management. Open knowledge sharing culture impacts the employees, so that they master their work roles well and achieve bigger work effectiveness (Vogelgesang, Lester, 2009). Employees are very encouraged to master their work roles, since then they better understand how their work contributes to the achievement of strategic company goals. Employees feel important and useful. What is more, employees can trust more in management when a company is

transparent. (Vogelgesang, Lester, 2009). Trust in transparency helps employees to make better decisions, since they are not afraid to be wrong (Street, Meister, 2004). In scientific literature about business transparency, ethical decision making model by Tenbrunsel and Smith-Crowe (2008) is supported, according to which employees, who know, that the activity of their company is transparent, are more responsible in making decisions at work. According to Halter et al. (2009), employees, working in a transparent environment, are willing to behave less self-willed, they tend to co-operate more with colleagues (Bessire, 2005) and with business partners in the cases of merging companies or acquiring them (Piske, 2002). Experienced transparency by internal subjects of a company impacts, that this experience will be transferred to external subjects.

Consumers and partners' benefit. Externally transparent business organizations are open for information sharing with current and potential consumers, members of logistics chain, investors and business partners. Perception of whether a specific organization is transparent (or its trademark, since the names of organizations and their activity are often related with the trademark of an organization, through the perception of external subjects), occur from the knowledge, of what a specific organization has done and not what it would have done in an ideal case (what real actions have been made by a certain organization, but not its promises, and also whether there is a big gap between its real actions and promises) (Bernstein, 2009). Business organizations, which are open for external subjects get benefit from consumers, who look at the trademark of such organizations more favourably (Arens et al., 2011), perceive organization as trustworthy (Brown, Michael, 2002), believe in price transparency of goods and fairness of its delivery procedures (Carter, Curry, 2010; Miao, Mattila, 2007), receive bigger satisfaction buying goods from an organization or using its services (Eggert, Helm, 2003), assign bigger value to goods and services of an organization (Carter, Curry, 2010; Eggert, Helm, 2003), trust in an organization more (Beulens, et al., 2005; Jahansoozi, 2006) and have intentions to buy goods and services in the future (Bhaduri, Ha-Brookshire, 2011). Transparency in the relationship with the members of logistics chain, impacts bigger effectiveness of supply chain, while coordinating material and raw material flows (Hultman, Axelsson, 2007), encourages cooperation (Beulens et al., 2005) and mutual trust (Beulens et al., 2005). It means, that employees, consumers, and business partners, who trust in a company due to its transparency, can create value added for a company and help in such way to gain more competitiveness on a market.

Benefit for organization. It is said, that organizations, which are transparent internally and externally, have bigger competitive advantage (Halter, de Arruda, 2009; Vogelgesang, Lester, 2009). What is more, transparency helps to expand the point of view of a company towards competition itself as a phenomenon (Halter,

de Arruda, 2009), and this allows to improve differentiation of products and reach targeted consumers for organizations (Carter, Curry, 2010). This benefit increases more co-operating with partners (Jahansoozi, 2006). Transparent organizations are usually more committed to internal and external subjects, in comparison to non-transparent organizations and this allows to form healthy and long-term relationships (Jahansoozi, 2006) and also increase common effectiveness of activity (Halter, de Arruda, 2009; Halter et al., 2009). What is more, efforts to increase transparency allow business organizations to avoid random decision making (Granados, Gupta, 2013). On the contrary, decisions, made in such organizations, are coherent from ethical point of view (Halter, de Arruda, 2009) and socially responsible (Awaysheh, Klassen, 2010). For example, companies, where marketing is based on the model of transparent decision making often choose to produce safer products, rather than the companies, which do not apply such model in their marketing (Beulens, et al., 2005). The model of transparent business decision making in marketing creates an atmosphere, where sharing complete information becomes a business norm (Bansal, Kistruck, 2006) and deceptive marketing actions becomes difficult to conceal (Warren, et al., 2012). Finally, transparency helps to create more favourable image of a trademark (Halter, et al., 2009) and transfer marketing message for the consumers (Miao, Mattila, 2007). Transparency between a company and the consumers of its goods and services is a tool, which allows to strengthen mutual relationships between two subjects (Gupta et al., 2008), and this helps to increase sales and profit (Carter, Curry, 2010).

Benefit for society. Representatives of contemporary society assess business companies not according to how much do they sell and what profit do they earn, but based on the criteria of triple goals (people, planet, profit). Assessment concept of triple goals becomes more popular, when society needs to compare or assess economic, ecological and social impact of companies. In this context, transparency becomes one of the key factors, which allows many business organizations to include these triple goals into their business strategies and reports (Elkington, 1998, 2004). All society wins in that case, when business organizations keep to the politics of transparency. For example, transparent organizations provide with proper and simple opportunities for learning, it is easier to reveal unfairness there, which was possibly concealed before. Transparency also contributes to education of consumers (Vaccaro, Sison, 2011) and in this way, allows balancing the power of organization and external associated subjects (more educated consumers can make bigger pressure towards organization) (Cheng, 2011). Transparent organizations much less abuse the resources of society (Vaccaro, Sison, 2011) or mispresent reality for its own benefit and falsify the results (Halachmi, Greiling, 2013; Hood, 2007), hide action plans (Jahansoozi, 2006) and get involved into corruption. Transparency means that the subjects, associated with

an organization, can keep organization accountable (Halachmi, Greiling, 2013; Jahansoozi, 2006; Ross et al., 2012; Stasavage, 2004; Vaccaro, Sison, 2011) and control its behaviour (Campbell, 2007; Halter, de Arruda, 2009).

How to increase transparency? There are many ways, but, no single answer to this problem is present.

The perception of business organization transparency takes an important part in the model of decision making. However, some organizations may avoid bigger transparency due to various legal and non-legal reasons, including a wish to hide unethical or/and illegal behaviour, a goal of impression management, lack of knowledge, distrust in internal and external subjects, fear of public reaction, maintenance of competitive advantage. Also, encouragement of transparency can be limited due to employees' unwillingness to change anything at work, avoiding additional responsibility, fear of losing connections and control, comfortable agenda. However, these aspects are not so widely researched in scientific economic literature. The biggest focus is mostly placed on the factors, which encourage and limit the organizations to be transparent, what mechanisms of transparency are applied in organizations and how much effective are they.

If the concept of transparency is associated with openness and the possibility to get information about organization and its activity, then what can the business organizations do in order to increase the transparency of its activity? Two reasons are pointed out in scientific literature, which impact subjects' perception about the transparency of organization: first, organizations must provide the subjects with complete information on time; second, organizations must share the information with other subjects in a such way, that it is clear and understandable for them.

We have to agree with Parris et al. (2016), that assessing transparency, subjects' (consumers, business partners) point of view towards a business organization is very meaningful. When we say, that the activity of some business organization is not transparent, we have in mind, that we do not have enough information about its activity or decisions, that we do not understand the decisions of this organization, they seem to be incorrect based on moral or ethical point of view. It means, that communication and interaction between business organization and other subjects is the foundation of transparency perception. Connecting parties in this communication chain process are employees of an organization, representatives of relations with consumers, human resources personnel, who transfer company values to an external environment, and non-personal communication tools, such as a company website, automatic phone reply system, email marketing messages and other.

A wide variety of initiated interaction types exists among business organization and associated subjects. For example, a subject can collect information about an organization through personal and non-personal channels, he can ask sales person about organization, request information through customer service phone number, search for information in a website of organization. Collected information in subject's mind form a general view about company's products, its legal, ethical and business practice. The subject can be interested in specific features of certain products, advantages and their benefit. He may wish to know, which country is the material imported from for the production of goods or under what conditions do the employees work. Business organization, initiating communication from its side may send information by email or text messages to the consumers about new goods and services, provide personal offers, inform about customer service conditions, distribute promotional publications, organize seminars about goods and services, organize sightseeing tours within a company. Other subjects' perception, about the transparency in a company, is aimed to increase in each of named communication types.

Willing to share information with other subjects, business organization should have such information. Information should be complete, appropriate for targeted audience and allowing to make decisions. When a business organization reveals certain information about itself for other subjects, it is said, that it sends a signal about its transparency for other subjects (DeKinder, Kohli, 2008). However, such information must be valuable for subjects. Non-profit organization "Global Reporting Initiative" (GRI), which helps business companies to become more transparent, says, that provided information will help the subjects to make decisions, but that information must be useful, understandable, complete, precise, neutral, comparable, clear and provided on time for targeted audience in an acceptable language and form (GRI, 2006). Similar characteristics of information are pointed out also by other authors: Christensen (2002) and Millar et al. (2005) stress the importance of information clarity, Piske (2002) – the meaning of information completeness, Beulens et al. (2005) – the necessity to provide information on time, Halachmi and Greiling (2013), Santana and Wood (2009), Sparrevik et al. (2010) with Zhou and Zhu (2010) – the need to provide information for external subjects in easily accessible places. Millar et al. (2005) also state, that one of the most important aspects of providing information, is to make sure, that the criteria of simple accessibility and clarity would be applied for formal and informal information about business company. This means, that it is not enough to simply announce information. Even talking in an informal environment, the representatives of business companies should remember, that they represent their company and avoid using complex terms, answering questions or disrespectful behaviour with other subjects.

It is noted, that a term "proper information" can have various meanings in different context. For example, in accounting and finance area, proper information usually means, that a business organization shares information about its financial activity, future forecast and current financial operations (Nielsen, 2004, 2005). In marketing department, providing proper information means that business organization shares information about materials used for production of goods, principles of pricing and regulatory conditions (AMA, 2010; Epstein, Roy, 2003; Hofstede, 2003; Oh, Lucas, 2006; Samper, Schwartz, 2013; van Dijk et al., 2003; WOMMA, 2010). Proper information in interpersonal communication area covers sharing personal information, such as the feeling of one subject for another subject (Chaudoir, Fisher, 2010; Jassawalla et al., 2010). In employee management and teamwork area, proper information is associated with sharing information about action motives, assessment criteria, decision reasons, there is no hidden agenda here, and feedback is guaranteed (Jassawalla et al., 2010; Palanski et al., 2011; Vogelgesang, Lester, 2009). In public administration area, proper information covers announcements and reports about the processes of decision making, analysis and presentation of activity results (Drew et al., 2004; Sparrevik et al., 2010). Where there are so many interpretations of possible proper information definition, the main challenge for an organization is to select, what type of information is necessary for other subjects. Unfortunately, subjective perception about what is necessary and what is not, creates a foundation for ambiguity and uncertainty. Due to this reason, the definition of proper information and preparation of its outlines should be the main goal for business organizations and leaders, who seek for transparency.

After having prepared outlines about proper information, it should be identified in business organization, how this information will be delivered to other subjects. This means, that business organizations must make the access of information for other subjects easier, since easy and simple availability of information is positively associated with the transparency of an organization (Srivastava, Frankwick, 2011). Reduction of uncertainty level is one of ordinary goals in business communication. That is why it is very important to admit for the organizations, that higher or lower uncertainty level always exist, but it is important to try to reduce it in a such way, that interested subjects (consumers) needed less efforts to get necessary information. At this stage, the managers of business organizations should understand, that other subjects could be interested not only in positive but negative information as well. For example, consumers may wish to know about negative features of goods and services, competence level of personnel, investors may be interested in the reasons for profit or loss in the organization and business partners. Based on Uncertainty Reduction Theory (Berger, Calabrese, 1975), when uncertainty level increases, people will increase their efforts to get necessary in-

formation. Willing to reduce these efforts, business organizations must help the subjects assuring simple accessibility of information. For example, pharmaceutical companies must provide with correct information about medicine, since the use of these products maybe associated with the risks for human health. Information is provided in patient information booklet, so the consumer gets this information straight away after purchasing medicine. Easy and simple access to information is assured in this way. However, a problem exists here, that provided information could be too complicated, full of specific medical terms, and a consumer may need additional efforts to understand that information. Organization's function in solving this problem is to take actions to prepare information, so that it is easily understandable for the consumer.

Summary: *creating transparency in business organisation, an important role is assigned to intermediaries of information transmission. Some of them, for example, customer service specialists, communicate with subjects directly, whereas other, such as a company website, promotional booklets, are used as the channels for information transmission. It is important, that the managers of an organization show an example of transparent behaviour and coordinate properly the work of all information transmission intermediaries. In such way, it will be assured, that external subjects get comprehensive information about a company (marketing, legal, personal connections and other). What is more, transparency must be developed in all functional areas and activities of a company. For example, if marketing area is transparent in a company, but production and/ or financial areas are not transparent, general level of transparency in a company will remain low. Ethical behaviour perception and reality interrelation – why is it important?*

The reality of ethical behaviour is a concept, which reflects how real values of an organization are expressed through the behaviour of their representatives, which means, that not what the employees or managers of a company declare, but how do they act in fact. It is noted, that the reality of ethical behaviour and ethical behaviour is not one and the same thing due to certain intermediary variables – company managers may try to behave transparent, however, they may not totally perceive the needs of other subjects or perfectly understand the needs of other subjects, but consciously ignore them. Only if both aspects, behaviour perception and reality, are compatible with each other, business company can expect to reach transparency of activity. Relationship between perception of ethical behaviour and reality in business organization is provided in Figure 42.

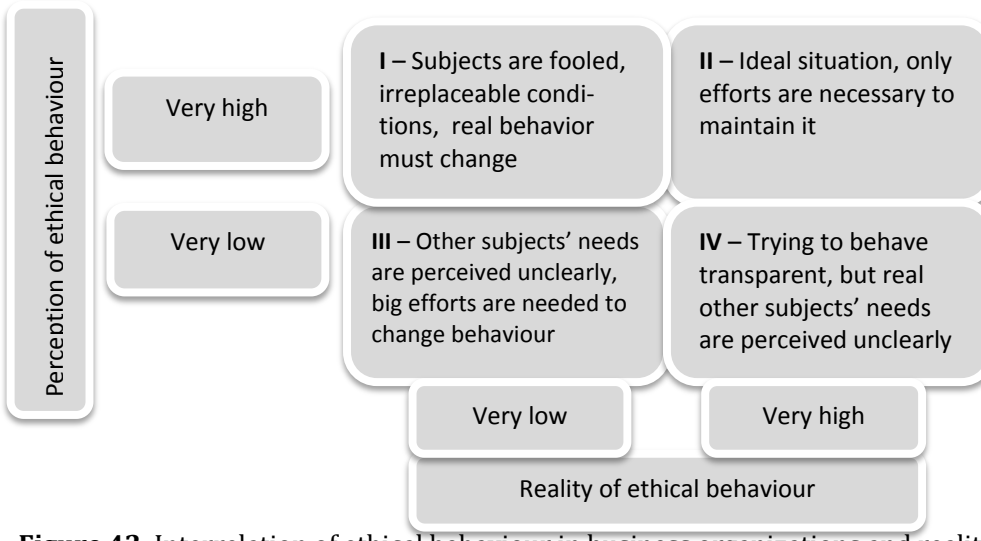

Figure 42. Interrelation of ethical behaviour in business organizations and reality

Source: compiled by the authors with the reference to Parris et al., 2016, p. 236.

As seen from Figure 42, when ethical behaviour perception of a company is very high, and reality is very low, it means, that a company understands what it does, however, it ignores external subjects' interests and fools these subjects. A company manages to hide its unethical behaviour, and external subjects may not know about it. However, it is naive to expected, that such situation will last forever. When subjects finally understand, how they are treated, hard times come for a company. When ethical behaviour perception and reality are very low, a company perceives unclearly external objects' needs and it is difficult to achieve transparency for it. External subjects usually know about it, so a company must try gradually improve situation and inform subjects about implemented innovations and changes. When ethical behaviour perception is very low and reality is high, a company tries to behave transparent and its ethical standards are in fact high, however they do not bring expected results, since external subjects' needs are not completely perceived. Therefore, a company in this situation has to communicate as close as possible with various subjects, conduct surveys and find out the real external subjects' needs. Finally, only when ethical behaviour perception and reality have high level, a company can achieve transparency of activity. It only needs to assure tools to maintain achieved level.

Business transparency and code of ethics – do we apply them in our business?

Fundamental need for a higher level of transparency and ethical behaviour encourages business organizations to introduce their codes of ethics. According to

Piercy and Lane (2007), before introducing one or another code of ethics, business managers should assess all moral and ethical factors among buyers and sellers. Dando and Swift (2003) say, that there is no universal standards, allowing to assure transparent business in social, ethical, environmental meaning, and there is no standards allowing to assure reliability of business organization. Only introducing codes of ethics, it is recommended to treat transparency as the main part for the creation of value added. Business organizations, which seek to conduct socially responsible activity, must respond to external subjects' needs. It is recommended to include similar statements to codes of ethics, which confirm company's commitment to assure transparency for internal and external subjects:

- We commit to provide you with complete information on time, without any delay and bias;
- We commit sharing good news about business with you and not so favourable information, which would allow us to improve;
- We commit to provide you with an opportunity to talk to us openly and easily;
- We commit to allow you to see us from inside, how do we work, why do we make one or other decisions.

Parris et al. (2016) names organization "Zappos.com" as an example of transparently working business organization. On 26th of April, in 2010, this organization announced about quarterly employees' meeting in their interactive website, which had to be broadcasted life. Life broadcasting lasted for a couple of hours (video was taken), employee' activities before the meeting, during the meeting and also relaxing activity after the meeting were included into a video. As organization "Zappos.com" later wrote: "We have invited the whole world to participate in our meeting. We do everything for the transparency of our activity, so it was very meaningful to invite all to our biggest quarterly meeting" (Melissa, 2010). Such open declaration about fostering transparency gives great results: in 2009, 2010 and 2011 organization "Zappos.com" has been rated by business magazine "Fortune" as one of the best from top 100 world business companies, where the employees would like to work; in 2011 organization, has been rated as one of top 40 the U.S.A. companies, which are the best in customer service area.

"Transparency International" Lithuania in 2015 has conducted transparency assessment for 41 biggest companies, operating in Lithuania, with own initiative, in order to show simply and clearly how much information about their activities do companies provide. Transparency rating was created according to received results for the biggest companies, which according to sales income in 2013 were included into an annual list of the biggest companies, composed by Verslo zinios. The research was composed of three main parts:

- Honesty politics of a company (information publicity);
- Organizational transparency of a company (information publicity);
- Financial transparency of a company (information publicity).

Received results during a research allowed to group the biggest companies according transparency in the following order (see Table 50).

Table 50. The most transparent companies in Lithuania in 2015

Place	Name of a company	Assessment
1.	AB Swedbank	91 pct.
2.	UAB Lietuvos energija	81 pct.
3.	AB Lietuvos gelezinkeliai	80 pct.
4.	AB TEO LT	77 pct.
5.	AB SEB	75 pct.
6.	AB Orlen Lietuva	59 pct.
7.	UAB Orion global pet	48 pct.
8.	AB Linas Agro Group	41 pct.
9.	AB City Service; AB Rokiskio suris	36 pct.
11.	AB LITGRID	31 pct.
12.	UAB Achemos group	30 pct.
13.	UAB Vilniaus energija	25 pct.
14.	AB INTER RAO Lietuva	23 pct.
15.	AB Pieno zvaigdes	21 pct.
16.	UAB MG Baltic	20 pct.
17.	AB Lifosa, UAB Maxima group	16 pct.
19.	Arvi group; Litagra group	14 pct.
22.	KG Group	13 pct.
23.	UAB Imlitex Holdings	11 pct.
24.	UAB Rimi Lietuva; UAB group Sanitex	9 pct.
26.	UAB Lukoil Baltija	7 pct.
27.	KB Lietuvos kooperatyvu sajunga	6 pct.
28.	UAB Rivona	5 pct.
29.	UAB Neste Lietuva	4 pct.
30.	Grupe Krekenavos agrofirma, UAB Norfos mazmena	2 pct.

Source: "Transparency International" Lithuania, 2015.

UAB Agrorodeo, AB Avia Solution Group, group Euroapoheca, UAB Girteka logistics, UAB Indorama Holdings Europe, UAB Indorama Polymers Europe, group Lytagra,

NFG Nacionaline farmacijos grupe, UAB Neo group, trade centre UAB Senukai have received 0 % assessment. Criteria and questions, which have been given for the respondents to assess their transparency are provided in Supplement 2.

Business transparency promotion model

Figure 43. Model of transparency promotion in business organizations
Source: Parris et al., 2016, p. 236.

As Dando and Swift (2003) state, social, ethical and environmental accountability of business organizations is necessary, seeking to increase general welfare in society. In this chapter, business transparency promotion model is provided for branch of economy and organizations aiming to adapt faster towards the requirements of transparent behaviour. The model shows, that transparency is very important, also what business organizations have to do in order to act transparent, and what is potential benefit of transparency (see Figure 43).

As seen from fig. 43, conditions, when business organization should try to increase transparency of its business, are distrust in organization by external subjects, unfavourable economic sector or trademark reputation, public scandals, selling undifferentiated goods and services, demand for high level of ethical behaviour. Transparency in business organization is promoted through sharing information about advantages and disadvantages of goods and services, motives and reasons for decisions, short-term and long-term organizational goals and tasks, primary data for decision making, conflicts of interest, primary and secondary data sources, supply chain and its parts (suppliers, their reputation, structure and quality of materials, delivery channels), triples goals, associated with people, planet and profit, tools and results for achievements. When sharing named information, it is important to know, what subject or subject group this information is for and assure, that it matches acceptable subjects' criteria for providing information: clear and easy to interpret, without slang, complete, precise, easily accessible, provided on time and in a desirable format, unbiased, comparable with other sources, not copied from other sources, provided on desirable time and at desirable place, if interested subjects wish, information can be provided personally. What is more, when providing information, it is important, that transparency initiative of business organization would be based on the needs of internal and external subjects and their correct perception, but not only on subjective managers and employees' opinion on how they understand transparency, since some inconsistences may arise between theoretical and practical implementation of transparency principles. To promote effective transparency, marketing and communication theory maybe needed, together with practical insights of researches.

The model of transparency promotion in business organizations can be applied at macro and micro levels. For example, at macro level, teams of managers within an organization can apply this model as a background for the creation of transparency strategies. At micro level, each business organization unit or information transmission channel can follow this model as guidelines, how to purposefully direct the efforts of transparency promotion for satisfaction of various subjects' interests. As noted by Parris et al. (2016), each unit in business organization should ask the following questions for external subjects:

- Do we currently provide you with necessary information? If not, what information would you like to get from us?
- What should we change, in order to provide you with the information you need?
- How could we facilitate conditions for you to get necessary information?

These questions could be asked by the sellers and customer service specialists for consumers, human resource specialists could ask questions for organization employees, managers could ask questions for their investors. Answers to these questions could significantly increase the perception of transparency in business organization. Of course, some subjects can ask for information, which will never be shared, for example, secrets of production, patented formulas, strategic data, since sharing named information would make competitiveness of business organization weaker. However, in this case it is very important to explain the reasons for decision of business organization, keeping certain data in secret. Cases can occur, when announcing the reasons for not revealing specific information can create negative reaction from interested subjects, they will be disappointed, that is why the explanation should be very comprehensive and complete. For example, a statement "this goes beyond our organizational information politics" is not a quite reasonable argument to explain, why certain information is not provided, since nothing is said about the reasons of organizational politics. That is why the statements of similar type can lower subjects' belief in transparency of an organization, form negative attitude and lower the intentions to buy.

Tracking and capturing achievements of transparency

After choosing to increase business transparency, each organization has to be able to track its achievements in this area. The first step, when capturing the achievements of transparency development in an organization, is the identification of all the subjects, associated with an organization (consumers, suppliers, state institutions, legal entities, tax inspections, investors, shareholders, employees, creditors, mass media, interested subjects, activist groups, business support groups). Then, in order to identify the needs of each subject from the named groups, representatives of these groups should be asked to take part in surveys with couple of questions and the answers could be assessed in 5 points rating scale. The questions could be similar to the following:

- How satisfied overall are you about accessible information regarding our organization?
- How satisfied are you about the volume of information, which is easily accessible for you?
- Do you think, that accessible information is prepared good enough?

- In your opinion, is information easy to understand?

After receiving the answers to these main questions, business organization should collect additional information about each targeted subject group on what, why, when, where and how much information about the organization they need.

Summary: XXI century is full of various business subject errors, connected with information about its activity. This impacted general opinion of internal and external subjects, associated with business organizations or business itself, that business is always more or less not clean, and business organizations can work only limited by legal, tax, social, ethical, environmental and other standards. Growing general distrust in business and multiple requests to increase ethical business standards within the last decade have encouraged increasing number of researches and studies, about business transparency, since until 2002, no researches of such type have been practically performed.

Today the majority of researches about business transparency are conceptual or qualitative, but the number of quantitative researches is still low. Scientists and researchers still try to compose the definition of transparency, identify the reasons and consequences of transparency and create methodologies, allowing to assess the level of transparency in a business organisation as precise as possible.

So far, presented definitions of transparency are quite abstract and can be applied not in all types of organizations or do not cover such features of transparency as openness, goodwill for a subject, and honesty. However, even based on not very comprehensive methodologies, which are only applied for a specific research, it was identified, that business transparency can improve social, ethical and environmental business practice significantly. Presented model (see fig. 43) shows, in what conditions business transparency is promoted, what organizations can do to become more transparent and what benefit of business transparency is for various subjects. This model can be used by various organizations, which seek to change their behaviour, image and effectiveness qualitatively adapting transparency as valuable principles in their activity. Transparency means, that a business organization is open for various internal and external subjects, guarantees access to at least minimum information, which allows subjects to better understand organization, its products and/ or services, certain decisions and actions. Benefit, that business transparency brings to a business organization, its employees, consumers, partners and whole society is perceived, when organizations deliberately seek for ethical business decision making and ethical business, which is focused on people, planet and profit.

4.4.2. Perception of Corruption Index in Lithuania

Corruption and transparency are associated with a game since a businessman or a representative of a Government has always to decide whether to participate or not in a process of corruption or transparency; will a game in a process of corruption or transparency provide with bigger benefit now or in the future. Since the features of corruption are peculiarities of negotiations in procurement, we will analyse them in a more detailed way within the following chapter. Corruption affects the society in various ways. In the worst-case scenario, it costs freedom for people, health and money. The costs of corruption can be divided into four main categories: political, economic, social and environmental.

While assessing political environment, it was noticed, that corruption is the main obstacle in democratic and legal state. Institutions lose their legitimacy, when violations take place due to private interests in a democratic system. Corruption uses national assets from economic point of view. Corrupted politics invest into limited public resource projects, which will complement their pockets through the priority level projects such as dams, power stations, pipelines, refineries more than the projects, which give benefit for the society such as schools, hospitals and road infrastructure. Corruption also makes difficulties for the creation of fair market structures and distort competition, which puts off the investors. This phenomenon also destroys the structure of social society. It creates threats for people' trust in political system, institutions and management. Distrustful and indifferent society can become one more barrier to fight with corruption.

Deterioration of environment status is another consequence of corrupted systems. Non-compliance with environment protection requirements and legislations means, that valuable natural resources are carelessly used and the whole ecological system is devastated. Companies keep paying bribes for coal mining, wood preparation in exchange for unlimited usage of natural resources.

Corruption perception index (further referred as CPI) shows, how corruption among the representatives of Government, municipality and politics is perceived within a country. This index is created based on the surveys of business representatives and other expert researches ("Transparency International" Lithuania, 2015).

CPI estimates are ranked in a scale of a hundred points where 100 points mean a very transparent country, and 0 points indicate a very corrupted country. Experts state, that it is very important to pay attention to the points of CPI and not to the place the countries take on the list. The points and the place on the list can be corrected with a change of methodology.

CPI collect data from a number of different sources, which provide the perception of business representatives and experts of a country about the level of corruption in a public sector.

"Transparency International" name the following stages, according to which CPI is calculated:

1. **Data collection**. Each source, which is used for the calculation of CPI, has to meet the following criteria in order to be acknowledged as a valid and reliable source:
    - Quantitatively to assess the perception of corruption in a public sector;
    - Has to be based on a reliable and valid method, which measures and assesses the majority of sources on the same scale;
    - Has to be performed by a reliable institution and expected to be repeated regularly.

CPI 2015 has been calculated using 12 different data sources from 11 different institutions in order to capture corruption through the past two years.

2. **Data standardisation.** Received data is converted into the points within a scale 0–100, where 0 point is the highest corruption perception level and 100 points is the lowest corruption perception level. This is done, subtracting data set average and dividing it from a standard deviation results with Z points, which are later regulated at 45 average and standard deviation from 20, so that data set satisfies a scale from 0–100. Average mean and standard deviation are taken from assessed points in 2012, so that the results could be compared against certain period from the initial timeframe.
3. **Calculating average**. In order to include a country or a territory into the calculations of CPI, at least three sources have to assess it. CPI of a country is calculated, as a possible average of all standard points in that country. The points are rounded until whole number.

8 sources were used in order to calculate CPI in Lithuania in 2015: 1. Bertelsmann Foundation Transformation Index; 2. Bertelsmann Foundation Sustainable Governance Indicators; 3. IMD World Competitiveness Yearbook; 4. Political Risk Services International Country Risk Guide (ICRG); 5. World Economic Forum Executive Opinion Survey (EOS); 6. Economist Intelligence Unit. Country Risk Ratings; 7. Global Insight Country Risk Ratings; 8. Freedom House Nations in Transit. CPI is one of the most famous researches of corruption perception in the world, which shows how various countries in the world manage to control corruption.

Lithuania took 32nd place among 167 countries in the world in 2015, Lithuania was assigned with 15th place when assessing only EU countries (see Supplement 3).

Based on corruption map in Lithuania, which was composed based on data from 2014, corruption in Lithuania was named as sixth out of seventeen problems: low salary took the first place (69 % of respondents), unemployment took the second place (63 %), alcoholism was named as the third problem (57 %), emigration from Lithuania took the fourth place (54 %), high prices/ inflation was named as the fifth problem (52 %), and ***the sixth place was assigned for corruption*** (48 %). Two years have almost passed after the survey and research, ordered by LR SIS (Special Investigation Service of the Republic of Lithuania), authors think that not so many changes on the list of the most important problems in Lithuania have changed.

As expert depth interview has shown, public finance and procurement are very sensitive for corruption. Based on data from a publication "Procurement: public money and transparency", published by "Transparency International" Lithuania, European countries spend around 16–18 % from GDP annually for procurement. The value of procurement in Lithuania is equal to one tenth from GDP or more than one third of national budget in Lithuania (LR State Control, 2011). Present corruption in this area increases a risk, that dedicated money will not be used effectively and the benefit, which could be received through contests, will not be taken, for example, the best value for the offered price, rational distribution of resources, and what is more, other economic factors, such as price inflation and a risk of inefficient work. Experts' opinion, stated in empirical part, reflects the results from the research, which was conducted in 2011, "A Map of Corruption in Lithuania". Based on "A Map of Corruption in Lithuania in 2011", in managers' opinion, receiving state orders is one of the most corrupt procedures (according to 30 % of respondents' opinion, this area is "very corrupt"). Similarly, procurement is evaluated by Government officials, according to data from the research. According to them, winning of procurement contests is the third most corrupt procedure. "Transparency International" (2009) gives the most comprehensive definition for corruption: *corruption is perceived as a violation of trusted power, when seeking for the benefit. It can be classified into big, small and political, despite from lost money and sector, where it belongs to. Big corruption consists of criminal activities, made by the Government officials of the highest rank, which manipulate politics or central Government function, which enable the leaders to make profit out of public benefit. Small corruption means abuse of daily power between small and middle rank of Government officials, when the citizens interact with them seeking to get access to major goods or services (hospitals, kindergartens, schools, police departments). Political corruption is the manipulation of politics, institutions and pro-*

cedural rules, when distributing resources and financing, by people, who make political decisions, violate their power, status and property in order to retain all of it.

It is admitted, that without knowing, in which areas corruption is likely to occur, it is difficult to choose methods and means to effectively fight with it. Seven years ago, in 2010 a regional project has been introduced: "Actions against corruption, based on evidence: studies of national resistance to corruption" and its part "Research about resistance to corruption in Lithuania", the goal of which was to identify how much different areas are resistant to corruption in Lithuania and how to promote bigger transparency there. The methodology of research has been created for making insights into a problem of corruption, researching the main state institutions and state life areas in order to identify their weak points and the ways how to strengthen them.

According to State Audit program in 2011, procurement was announced as the priority for state action, audit planning and implementation area. The following aspects have been named as the most sensitive problems of procurement system in Lithuania: the lack of transparency and information; application of the lowest price, as the major assessment criterion; unreasonable, protectionist conditions within the documents of purchases; complicated regulation; long procedures; inefficient control of procurement process; low centralized level of procurement; immunity from legal penalties when breaching procurement order; lack of control for already conducted procurement; insufficient analysis for costs and benefit; constant change of legal basis for procurement regulation, which leads to discontent of participants within procurement system and certain errors; ineffective examination system for procurement disputes, especially the last stage – solving disputes in courts ("Procurement: public money and transparency", p. 2).

Special Investigation Service conducted a sociological research in October, 2008 about the transparency in procurement, the results of which show, that the probability of corrupt deals is the biggest when qualification requirements, technical specifications are included into the requirements for procurement participants, also when assessing offers and announcing the winner. This research (so far it is the newest representative sociological research for procurement transparency) distinguishes similar problems as the named program. According to business representatives, corrupt deals are most likely when technical specifications and qualification requirements are included, and when they were asked to name the most sensitive problems, which they face in procurement, they stated that huge amount of documentation, corruption, bureaucracy and selected winner in advance (Research about transparency in procurement, 2008).

Without the calculation of CPI by "Transparency International", various attempts to overview and assess phenomenon of corruption from narrow positions of sci-

ence would not allow to make a comprehensive picture about the specifics, complexity and possible consequences of this phenomenon (Palidauskaite, 2005). According to Palidauskaite (2005), different definitions for corruption and the tendencies for the development of corruption allow to make a specific opinion about this complex negative phenomenon within the society. Corruption adapts to the development of society and technology, gaining new forms, which are recognised only later and this fact makes the fight with corruption even more difficult. On the other hand, despite single successful attempts to fight with corruption, today it still exists, because the attempts to import the models how to fight with corruption do not bring expected results. One of the reasons for failure is concentration of fight at an individual level and not at an organizational level, forgetting the importance of manager's position and behaviour within an organization, context of environment. Corruption has become a global problem within a society, since it crossed the borders of a country, region, and requires bigger attention and even more serious persistence in fighting with this negative phenomenon (Palidauskaite, 2005, p. 35).

CONCLUSIONS

- ✓ Each business subject has distinct features in himself or in connections with an external environment. Game Theory allows to identify these distinct features and use them properly. Improvements of Game Theory within the last decade can help the managers of business companies to achieve expected results, purposefully choosing strategies in certain situations of conflicts of interest. Company manager, once foresees an advantage to act in a local and foreign markets, is willing to look for more favourable possibilities to develop his activity, and this positively affects the growth of economy within a country. However, Game Theory is not yet completely overviewed: there are some situations in a real business world, which do not fit into the frameworks of Game Theory, therefore the choice of a successful business strategy in most of the cases remains real art.
- ✓ Experts, who have participated in the research, represent three types of competitiveness (perfect competition, oligopoly and monopoly), they understand Game Theory as making a common action deal with the competitors and aiming for common benefit between two or more competing parties. It means that Game Theory in a business world is treated as a search for co-operative opportunities with competitors, which are beneficial for both/ all parties and a necessary tool to analyse the process of solving conflict situations, especially in a constantly and quickly changing environment.
- ✓ The experts, who represent three markets of competitiveness, see the application of Game Theory strategies in business differently. The players of perfect competition market named the most important possibilities of Game Theory application in business as creation of business connections with other participants in the market, implementation of set goals within a company and maintenance of competitive advantage. The representatives of perfect competition market, in comparison to oligopoly and monopoly market representatives, cover relatively lower part of market, so they do not have the possibilities to make bigger impact on the prices or other strategic decisions. Whereas the representatives of oligopoly apply Game Theory more than the participants of perfect competition market, accepting chosen decision models and seeking to reach the effect of synergy. What is more, it is very important to make business connections for the representatives of oligopoly market, get competitive advantage and achieve set goals, while adapting the basics of Game Theory in practice. An interesting fact, is that the representatives of oligopoly market take part in negotiations, go into compromises, make secret deals only when it is strategically effective for their activity.

- ✓ The results of expert assessment have shown, that the principles of Game Theory have been applied within Lithuanian business in order to make the connections during competitive co-operation with business competitors seeking for the results, which are beneficial for all the parties, to identify the quantity of an order and manage the risk of market prices. It is noted, that among the named goals, an important part is assigned for the negotiations and the power of negotiations. What final result will be achieved, depends a lot on the skills of negotiators, the size of negotiating power, competitive advantages, acquired within international markets, taken position in the market and other factors.
- ✓ Will a player, who chooses a wrong game, always incur only negative consequences? Of course, not. When one chooses incorrectly, opponents might be misguided, false impression of held strategy can be created, and all this can be beneficial in the future. A very useful experience is taken from a wrong game, when certain market conditions are not present, then chosen game strategy gives a negative result and a list of mistakes can be written clearly, which had to be avoided in current situation. Unsuccessful game played today creates a reason to play back in the near future, especially looking from a positon for long-term perspectives.
- ✓ Naming the consequences, which a player can expect, when choosing a wrong game in a certain situation of conflict of interests, short-term and long-term consequences have been distinguished. Short-term consequences (the loss of clients, reduction of income, financial losses) are not very painful losses for a company. They are temporary and can be solved in one way or another. Whereas long-term consequences lead to a bankruptcy, collapse of a market and the nearest expectations in a market. However, even seeing the saddest perspective, a businessman will always look for another game, which is more favourable.
- ✓ Co-operative games are the most popular among the experts, who have participated in the research. Lithuania is the country of a small and open economy, therefore to co-operate and agree with your competitors is more effective since the possibilities to get a big order increase, also to complete tasks on time, share your abilities, which cannot be provided by intellectual or material resources of one company, to discover foreign markets, make new connections with foreign partners and other. Competitors have been, are and always will be in each segment of a business, whom you will have to maintain relationships with, which are acceptable for both parties in the best-case scenario.

- ✓ Since the majority of our research participants have identified the benefit of Game Theory and the possibilities to apply it in negotiations, the experts have been additionally asked about the difficulties they experience in negotiations or other peculiarities. The results of depth interview confirmed the problem, raised in "The Map of Corruption in Lithuania", 2011, which is corruption in public contests. Even though the procedures of procurement should assure equal conditions for competitiveness, some mistakes are present there, and small and medium businesses suffer from them. According to business representatives, the company, which has offered the lowest price, makes suffer its employees, since very high technical specific requirements are always present additionally to the requirement for the lowest price. What is more, the conditions of a contest often discriminate young business, which does not have more than 3–5 years of required experience activity in a market, and its annual turnover also does not reach required amount, stated in the requirements of a purchasing contest. Some cases occur, when a state gives a monopoly power for a chosen company through an exceptional attention and support, and these actions create unequal rights to compete for other companies in the same sector.
- ✓ It can be clearly stated, that Game Theory reflects the principle of conducted negotiations: if you plan numerous games – you are more flexible in negotiations, if you plan a single game – you do not avoid cheating against other player. It was identified, that cartel agreements and secret talks are very common in Lithuanian procurement. Nash equilibrium can be seen in this phenomenon, when every participant, even knowing, that the benefit is lower, but guaranteed, is going into negotiations and maintains the positions from a general agreement.
- ✓ Psychology of negotiations performs a very important role in negotiations, cartels and secret talks. Emotions, shown during the negotiations, no matter positive or negative, can help to achieve the goals of negotiations. Hidden negative emotion enters stem cells and remains there, that is why additional energy has to be used when communicating with an opponent, physiological agitation (concern) rises and the opponent feels it. Why are we afraid to be emotional? First of all, being emotional means to become dependent and refuse rationality, be seen as weak and lose control. Secondly, emotions can force people worry, whereas when you put a mask of "friendship and collegiality" you can protect yourself from emotionally based dialogue. Thirdly, the majority of negotiators lack of words to define emotional experience clearly, therefore they concentrate on such things as property division or payment distribution. It means, that it is

easier to discuss essential questions in business meetings, than such abstract topics as worry about the future of a deal, humiliation due to totally unsatisfactory conditions.

- ✓ Lithuanians do not have any particular traditions of negotiations and this encourages to adapt to the negotiations' specifics of other country. It is worth to mention, that competitive conditions in Lithuania are not equal for all market participants in business environment since the majority of orders, business deals are made using personal connections. The traditions of negotiations in Lithuania can be named in one word which is corruption: managing interrelationships, acquaintances, Lithuania is so called "a big village" or the land of brothers, where everyone is related here. Transparency is a tool for manipulation with other party in a game: provided information creates a player's image and forms an opinion on what strategy he will follow. Information about yourself can be modified and other party's perception can be manipulated regarding the strategy you would follow.
- ✓ Lithuanian business applies Game Theory in its activity, however it does not name as such. The principles of Game Theory are especially popular among the representatives of oligopoly, who use the advantages of Prisoner's dilemma, cartel agreements and secret talks.

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ANNEXES

ANNEX 1

> *The easiest way to neutralize your enemies is to invite them into your tent.*
> *Doz and Hamel, 1998*

Dear Expert,

I am a scientist from Lithuanian Agrarian Economics Institute. Currently with a co-author Professor L. Gaspareniene we write a monograph "Applications of Game Theory in Business Decisions". We would like to kindly ask you to answer the questions, which would help to identify prevailing strategies of Game Theory and the directions for Game Theory application in business. Your provided information will be used in scientific researches and analysed generally. *Your participation in the research is very important. The results will be provided for you upon the request.*

Could you please send completed questionnaire to the following email address: rita.remeikiene35@gmail.com

Part I. General information about the expert:

1) In what business area does your company operate?
   a) Furniture industry;
   b) Telecommunications, connection, technology sector;
   c) Food industry;
   d) Other (please, indicate)_____

2) What is your management experience in business?
   a) Up to 4 years;
   b) 5-10 years;
   c) 11-15 years;
   d) 16 years and more.

3) What market "player" is your company?
   a) Monopoly;
   b) Oligopoly;
   c) Perfect competition player;
   d) Other (please indicate)_____

Part II. Game Theory application in business

1. **Could you please choose, in your opinion, the best definition for Game Theory in your business?** Please evaluate the importance of statements/definitions, provided bellow. A scale of five is used for the evaluation: where 1 point – totally disagree with the statement, and 5 points – totally agree with the statement. Different statements can be evaluated with the same amount of points.

	Definition of Game Theory	Totally disa-gree	Disa-gree	Do not have an opinion	Agree	Totally agree
1.	Mathematical scientific theory, through which the results of single players' strategy are aimed to be foreseen, when they do not have all information about other players' behaviour. Game Theory is applied in economics to guess the behaviour of market participants. (Dictionary of Economic definitions)	1	2	3	4	5
2.	Game Theory analysis is the process of making collective decisions, when interests of two or more subjects, who make decisions, do not match. (http://ekonomika.tv3.lt/ekonomikos-terminu-zodynas/losimu-teorija#ixzz4CJOt6i79)	1	2	3	4	5
3.	Game Theory is the theory, which analysis irrational subjects' (players') behaviour, since the possibility of winning is much lower than the possibility of losing in a game (according to Kumar, 2009)	1	2	3	4	5
4.	Game Theory is the method of solving conflict of interests, which is meaningful to apply in order to make an optimum decision between two or more subjects in an uncertain situation (according to Myerson, 2013)	1	2	3	4	5
5.	Please provide your definition_____ _____	1	2	3	4	5

2. **How, in your opinion, the application of Game Theory strategy could be beneficial for business?** (You can choose more than one option).

a) Can help to define strategic intentions of a company
b) Can help to implement set goals of a company
c) Can help to maintain and increase competitive advantage of a company
d) Can help to establish connections with other business subjects (suppliers, consumers, competitors)
e) Can help to distribute the resources of a company effectively
f) Can help to implement chosen decision models
g) Can help to achieve the effect of synergy
h) Other (please indicate)_____

3. **Do you apply Game Theory in business decision making within your company?**
   a) Yes, every time in uncertainty situations
   b) Yes, but rarely, when very important strategic decisions have to be made
   c) Yes, but very rarely
   d) No (if you have chosen "No" for this question, please discontinue answering the following questions)

4. **What purpose for do you use the principles of Game Theory and its tactics?** Please evaluate the importance of statements/definitions, provided bellow. A scale of five is used for the evaluation: where 1 point – totally disagree with the statement, and 5 points – totally agree with the statement. Different statements can be evaluated with the same amount of points.

No.	Goals	Totally disagree	Disagree	Do not have an opinion	Agree	Totally agree
1.	**Assuring co-opetition**	**1**	**2**	**3**	**4**	**5**
1.1.	Making the possibilities for co-opetition with business competitors when seeking for the results, which would be useful for both parties	1	2	3	4	5
1.2.	Establishing leadership in a market	1	2	3	4	5
1.3.	For negotiations, acquire the power of negotiations	1	2	3	4	5
1.4.	Acquisitions of companies	1	2	3	4	5
1.5.	Modelling activity of alliances	1	2	3	4	5
1.6.	Co-operation and partnership for creating infrastructure	1	2	3	4	5
1.7.	Other (please indicate)_____	1	2	3	4	5
2.	**Management of supply chain**	**1**	**2**	**3**	**4**	**5**
2.1.	Strategic integration of game principles into the management of supply chain	1	2	3	4	5
2.2.	Optimization of cargo transportation	1	2	3	4	5
2.3.	Other (please indicate)	1	2	3	4	5
3.	**Economic and financial decision making**	**1**	**2**	**3**	**4**	**5**
3.1.	Investment management	1	2	3	4	5
3.2.	Management of strategies for direct foreign investment	1	2	3	4	5
3.3.	Other (please indicate)_____	1	2	3	4	5
4.	**Business control**	**1**	**2**	**3**	**4**	**5**
4.1.	Identification of optimum method for business control	1	2	3	4	5
4.2.	Identification of order quantity	1	2	3	4	5
4.3.	Other (please indicate)	1	2	3	4	5

No.	Goals	Totally disagree	Disagree	Do not have an opinion	Agree	Totally agree
5.	**Management of business risk**	**1**	**2**	**3**	**4**	**5**
5.1.	Investment risk management	1	2	3	4	5
5.2.	Management of risk for market prices	1	2	3	4	5
5.3.	Avoiding risk	1	2	3	4	5
5.4.	Risk decision making in critical situations	1	2	3	4	5
5.5.	Fixing value of property	1	2	3	4	5
5.6.	Interrelation between company statements of environmentally friendly advertisements and its practice	1	2	3	4	5
5.7.	Other (please indicate)_____	1	2	3	4	5
6.	**Evaluation of intellectual property of a company**	**1**	**2**	**3**	**4**	**5**
6.1.	Strategic scenario planning for intellectual property of a company	1	2	3	4	5
6.2.	Knowledge sharing, information inside a company	1	2	3	4	5
6.3.	Knowledge sharing, information with other companies	1	2	3	4	5
6.4.	Other (please indicate)_____	1	2	3	4	5

5. **What tactics do you use the most frequently, when making business decisions?** (explanation: *Tactics is the choice of game type for negotiations, manoeuvring).*

a) Tactics in "fog" conditions *(business subject is never sure about what is going on for real, what are all possible solutions, how the opponent perceives the situation, what is the situation of his competitors in the opinion of his opponent)*

b) Tactics in "obscure" conditions *(hiding company's pricing, marketing, distribution, advertisement and other strategies from competitors with the aim that the competitors would not use similar strategies)*

c) Manipulation in volume tactics (*business company controls, increases or reduces, the volumes of goods, placed on a market, ordered or sold; and in this way, it can stop the competitors from copying its goods, prevent the competitors from entering a market).*

d) Retention of value added tactics *(sales volumes are not so important for a company, it is more important to assure the quality of goods and services and create bigger value added in such way)*

6. How would you evaluate the power of your company in a market?

a) High power level: "I am stronger than my opponents and can impose my interests to them".

b) Balanced power level: "I am as the majority of my opponents; I and my opponents have the same power".
c) Low power level: "I am weak and cannot force my opponents to act according to my interests; if possible, I am willing to wait till my strongest opponent decides, what actions he will take and then I am going to make my decision".

7. **In your opinion, does the player, who chooses a wrong game, always incur only negative consequences? Could you please comment.**

8. **Does the winning always give expected benefit?**

9. **What consequences can a player expect, when he chooses a wrong game in certain conflicts of interest situation? Could you please comment.**

10. **Bigger part of society pays huge attention to the prices, when acquiring goods/services. What price setting strategy do you apply in your company the most frequently?** More than one option can be chosen.

    a) **Price skimming strategy.** When a new good is introduced on a market and high enough price level can be maintained seeking to maximise profit.
    b) **Entrenchment strategy.** A company sets relatively low price for goods, which are placed on a market.
    c) **Entrance strategy**. A company wants to enter a new market, therefore it sets lower than average prices.
    d) **Price and quality strategy**. A company keeps relatively high prices, seeking to highlight the quality and uniqueness of a good.
    e) **Price strategy, oriented into competitors.** Competitors' prices for analogous goods are assessed and based on them the respective prices are set.
    f) **Differentiated prices strategy.** A company sells the same goods at different prices, even though their expenses are the same.
    g) **Falling price strategy.** A company, seeking to remain in a market, or trying to cover bigger part of a market, maintains relatively lower prices than its competitors.
    h) **Applying price discount strategy.** A company, seeking to sell higher amounts of goods, apply additional discounts for a customer, who buys in bigger quantities. In such way, "an ordinary" price of a good is maintained and goods are sold cheaper at the same time.

11. **What factors determine, that a specific pricing strategy (which is defined and listed in the question number 10) will be chosen, looking from the perspective of Game Theory?**

No.	Factors	Totally disagree	Disa-gree	Do not have an opinion	Agree	Totally agree
1.	Power level of participating players	1	2	3	4	5
2.	Skills of negotiations	1	2	3	4	5
3.	Behaviour and actions of other players	1	2	3	4	5
4.	Optimistic and pessimistic scenar-ios of a game	1	2	3	4	5
5.	Financial status of business	1	2	3	4	5
6.	Payoff of a game	1	2	3	4	5
7.	Experience in cartel agreements	1	2	3	4	5
8.	Posture of a player, connections between a player and his oppo-nents, including players' attitude towards competition and co-operation	1	2	3	4	5
9.	Power of players' negotiations (real and perceived) in a specific game	1	2	3	4	5
10.	Other (please indi-cate)_____	1	2	3	4	5

12. Which game strategy is applied in your company the most frequently?

No.	Types of Game strategies	Totally disagree	Disa-gree	Do not have an opinion	Agree	Totally agree
1.	Zero-sum game: "If possible, I would like to destroy my competi-tors; if it is not possible, I would like to make them weaker, so that they were not able to threaten me in the future" (strict competitive or fighter's attitude).	1	2	3	4	5
2.	Non co-operative games: "My competitors exist, and they have a right to exist, because there are many opportunities in a market for everyone. However, I admit, that we will always have conflict of interests among each other. I will act so, that to acquire and main-tain space, which is necessary for my survival and growth" (individu-alistic or combative attitude).	1	2	3	4	5
3	Co-operative games: "I need to	1	2	3	4	5

No.	Types of Game strategies	Totally disagree	Disa-gree	Do not have an opinion	Agree	Totally agree
	survive, as my competitors do. Therefore, it should be possible to find a certain relationship form, which would allow us to coordi-nate actions and make a decision, which is the best for all of us" (associative or communicative attitude).					

13. You make decisions in game situations according to (more than one option can be chosen):

a) Subjective opinion
b) Principles of morality
c) Statements of company results (balance, profit and loss report, cash flow report)
d) Mathematical-economic calculations
e) Common agreements with colleagues
f) Advice of experts
g) Other (please indicate) _____

14. In what type of games do you usually take part in? More than one option can be chosen.

a) Cartel agreements
b) Repetitive games
c) Threatening to enter a market game (A new company chooses, whether to enter a new market or not, and an old company decides in response to the previous, whether to lower the prices or not)
d) Negotiations
e) Prisoner's dilemma
f) Consistent games (one player is a leader, another is a follower)
g) Other (please indicate) _____

Thank you very much for your time and your answers!

ANNEX 2

Questions, which were provided for the assessment of transparency within the companies (Transparency International Lithuania)

Part 1. Transparency politics within a company (publicity of information)

1) Has companies group a publicly announced commitment to fight against corruption?

2) Do companies group commit publicly not to breach legal standards, which are associated with its activity, including anticorruption standards?

3) Do the leadership of companies group publicly express support in fighting against corruption?

4) Is publicly available code of conduct or behaviour/anticorruption program applied for all employees in companies group?

5) Is publicly available code of conduct or behaviour/anticorruption program clearly applied for all representatives (agents) and other intermediaries of companies group?

6) Is publicly available code of conduct or behaviour/anticorruption program applied for contractors, subcontractors and suppliers of companies group?

7) Do companies group publicly announce about learning program for fighting against corruption, provided for employees?

8) Do companies group publicly announce about the procedures for possible/restricted gifts, service or travel expenses?

9) Is publicly announced about the procedures, which prohibit tax payment facilitation?

10) Do companies group publicly declare about not applying severe measures for employees or other people, who inform about breach of company procedures?

11) Do companies group announce about the information channels, which can be used by employees, who want safely and confidentially inform about potential breach of procedures within a company or ask for an advice (trust line)?

12) Do companies group announce about regularly conducted overview of behaviour/ethics code (anticorruption program)?

13) Is publicly announced existing procedures within a company, which prohibit from supporting political parties/powers, or if a support is allowed, is all information revealed, which is associated with such support?

Part 2. Organizational transparency of a company (information publicity)

14) Do companies group reveal the list of patronizing owners of a company (physical entities)?

15) Do companies group reveal the list of patronizing shareholders (legal entities)?

16) Do companies group reveal the list of owned companies?

17) Do companies group reveal, which part of a daughter company is owned?

18) Do companies group reveal the establishment countries of daughter companies?

19) Do companies group reveal the activity countries of daughter companies?

20) Do companies group reveal the list of associated group companies?

21) Do companies group reveal, what part of associated companies belong to companies group companies?

22) Do companies group reveal the establishment countries of associated companies?

23) Do companies group reveal the activity countries of associated companies?

Part 3. Financial transparency of a company (information publicity)

24) Do companies group publicly announce the amounts of income/sales in Lithuania?

25) Do companies group publicly announce the investment into long-term property in Lithuania?

26) Do companies group publicly announce the size of profit before taxes?

27) Do companies group publicly announce real paid profit tax in Lithuania?

28) Do companies group publicly announce the input for society in Lithuania?

ANNEX 3

CPI index in EU countries

Place of a country	Country	Score
1.	Denmark	91
2.	Finland	90
3.	Sweden	89
4.	The Netherlands	87
5.	Germany	81
6.	The United Kingdom	81
7.	Luxembourg	81
8.	Belgium	77
9.	Austria	76
10.	Ireland	75
11.	Estonia	70
12.	France	70
13.	Portugal	63
14.	Poland	62
15.	Cyprus	61
16.	**Lithuania**	**61**
17.	Slovenia	60
18.	Spain	58
19.	The Czech Republic	56
20.	Malta	56
21.	Latvia	55
22.	Croatia	51
23.	Hungary	51
24.	Slovakia	51
25.	Greece	46
26.	Romania	46
27.	Italy	44
28.	Bulgaria	41

Source: Transparency International Lithuania, 2016.

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To write a monograph about Game Theory encouraged the following reasons: first of all, the lectures "Game Theory and it's practical application" have been the most interesting for the students during the whole cycle of delivered lectures, secondly, analytical information in different languages on this topic is not so common, not in Lithuanian language at least, and thirdly, the authors wanted to test how widely companies in Lithuania have applied the principles of Game Theory in their daily activity and how beneficial they have been for the business.

This monograph should be of interest for the representatives of business world, young people, who study social sciences (and not only!) and it also targets people, who are into such phenomenon as negotiations, business transparency, the meaning of emo-tions in decision making and the game itself. Of course, this monograph is not about gambling literary, but about the game essence of which is to get direct/indirect benefit from the choice of Game Strategy in all situations.