St. Petersburg State University
Graduate School of Management
Master in International Management Program

COOPETITION AS A LEAD GENERATING MECHANISM: DESIGN, MODELING AND SIMULATION.

Master's Thesis
Concentration: Master in International Management

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ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

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I, Maksim Shlegel, second year master student, program «Management», state that my master thesis on the topic « Coopetition as a lead generating mechanism: design, modeling and simulation», which is presented to the Master Office to be submitted to the Official Defense Committee for the public defense, does not contain any elements of plagiarism.

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АННОТАЦИЯ

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Название магистерской диссертации	Коопетшн, как лидогенерирующий механизм: разработка, моделирование и симуляция
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Научный руководитель	Зенкевич Николай Анатольевич
Описание цели, задач и основных результатов	Целью данной магистерской работы является определение потенциального воздействия на отрасль, лидогенерирующей коопетициии на базе интернет-платформы среди компаний, работающих в данной отрасли. Результатом данной магистерской работы является подробное описание концепта механизма лидогенерирующей коопетиции, на базе интернет платформы. С помощью средств агентного моделирования и симуляции, были получены данные, позволяющие предполагать, что разработанный инструмент потенциально способен оказывать положительный эффект на некоторые отрасли, и выгоден для большинства компаний участников данных отраслей. Так же на базе полученных результатов можно предполагать, что данный инструмент способен повышать степень прозрачности рынка, к которому он будет применен.
Ключевые слова	Коопетиция, коопетишн, кооперация, конкуренция, теория игр, агентное моделирование, симуляция, коалиционное разбиение, прозрачность рынка, распределение выигрыша

ABSTRACT

Master Student's Name	Maksim Shlegel
Master Thesis Title	Coopetition as a lead generating mechanism: design, modelling and simulation
Faculty	Graduate School of Management
Main field of study	Management
Year	2016
Academic Advisor's Name	Nikolay A. Zenkevich
Description of the goal, tasks and main results	The goal of this master thesis is to define potential impact that can be caused by a lead generating internet platform-based coopetition among companies, which operate in one industry, on this industry. The main result of current master thesis is a detailed description of the concept of the lead generating internet platform-based coopetition. With the tools of agent-based modeling and simulation, there were obtained results that could be used as a base for suggestion that the developed concept can potentially cause a positive effect on some industries and can bring some extra profitability for most companies that operate on this particular industry. Also on the basis of the results it can be assumed that the developed instrument is also able to increase the degree of transparency of the market to which it is applied.
Keywords	Coopetition, cooperation, competition, game theory, agent-based model, simulation, coalitional partition, market transparency, pay-off distribution

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INTRODUCTION

Nowadays there can be detected a growing interest to the topic of coopetition as a strategy of inter-firm relationships (Bouncken et al., 2015). Academic literature defines coopetition as a kind of interaction among organizations, which simultaneously cooperate and compete to each other (operating in one industry) to improve their financial results (Brandenburger and Nalebuff, 1996). Another significant trend of modern business environment are internet-based platforms, which also occasionally characterized as a multi-sided markets. These platforms simultaneously try to satisfy needs of more than one group of users (Armstrong, 2006). Examples of such platforms are: Youtube, Uber, Amazon Marketplace. Topic of current research is located on intersection of these two spheres of academic knowledge. However, to make them work together author also uses some concepts and principles of cooperative game theory, due to the fact that coopetition involves cooperation as one of its components, and cooperation is discussed widely in terms of cooperative game theory (Chakravarty, Mitra and Sarkar, 2015).

The goal of this master thesis is to define potential impact that can be caused by a lead generating internet platform-based coopetition among companies, which operate in one industry, on this industry. To reach this goal there was defined a list of objectives. Creation and description of a design of a lead generating internet platform-based coopetition. Detection of a potential impacts of the suggested lead generating internet platform-based coopetition on individual participants of market with different price/quality strategies. Identification of a possible impact of number of the lead generating internet platform-based coopetition members on the effectiveness of the lead generating internet platform-based coopetition. Definition of effects that number of the lead generating internet platform-based coopetition participants can cause on an average utility of clients of industry, which applies lead generating internet platform-based coopetition.

The structure of the thesis sticks to the order described above. It contains 5 chapters. The first chapter of current research discusses topics of academic knowledge, which are used by author to create a design of a lead generating coopetition mechanism. Main theoretic concepts and fields of knowledge, used in current research: coopetition, game theory, multisided internet platforms. In the second chapter author describes a methodology, which he uses to make current research. Then in the third chapter author moves to the coopetition lead generating mechanism design description. In the fourth chapter there is a description of an agent-based model, used to run a simulation of a market with one product and one advertising tool. Parameters and border values for this model are taken from Russian web-design industry researches described in the

second section of the fourth chapter. The third section of fourth chapter provides the analysis of results that were collected from the simulation. In terms of this analysis author tries to answer the reach second, third and fourth objectives of current research. Finally in the last chapter there is a discussion of findings and contributions of this work from the perspectives of theory and practice, limitations and further directions of possible studies.

The main theoretical developments of current research is a concept of lead generating internet platform-based coopetition and evaluation of its potential impact on a particular industry.

1. STATE-OF-THE-ART of COOPETITION, COOPERATIONAL GAME THEORY AND PLATFORM BASED MARKETS

Object of the study is a coopetition as a lead generating mechanism. It is designed standing on the principles of multi-sided internet platforms and coopetition. Current chapter is designed to describe principles, rules, and concepts, which are used as a basis for a concept of lead generating coopetition, described in the third chapter of the research.

1.1 Background

For recent years there is a trend that demonstrates a dramatic increase of popularity of coopetition (simultaneous cooperation and competition) as a strategy for development of companies (Brandenburger and Nalebuff, 1996; Bengtsson and Kock, 2000). Especially this trend could be detected in academic literature and researches (Bouncken et al., 2015). Nowadays coopetition starts to be discussed from the perspective of the Game theory (Kalai and Kalai, 2012). And used as a strategy for internet platforms, such as Amazon Marketplace (Ritala, Golnam and Wegmann, 2014). These trends became a starting point of current research, and pushed author to the idea of design of a concept of lead generating coopetition that could work on a base of multi-sided internet platform. However, from the standpoint of author, design of such concept requires investigation of several theoretical fields, such as: coopetition, cooperative game theory and internet-based platforms.

1.2 Concept of coopetition

There are several ways of possible interaction among organizations. One of the classifications gives us four following types: competition, collaboration, coexistence and coopetition (Bengtsson and Kock, 1999). Coopetition is a kind of interaction, when firms cooperate and compete to each other (operating in one industry) to improve their financial results (Brandenburger and Nalebuff, 1996). In other words entering a coopetition firms try to increase the values of the whole market to share it in competition later: “to create a bigger business pie, while competing to divide it up” (Walley, 2007). One of the best explanations of the phenomena coopetition refers to Kirk S. Pickett who in 1913 described the relationship among oyster dealers, saying that all of them are not just in competition with each other, but in cooperation developing more business for each participant of the market, which means that these oyster dealers in co-opetition now, not in competition (Cherrington, 1976). Basing on all abovementioned information we can derive that coopetition is a kind of competition in terms of

cooperation, when all players try to make market on which they play “bigger”, to share this “bigger” market among them by competition activities.

In other words coopetition is an inter-firm strategy, when companies at first focus of the increase of the profit that their industry can give to them. At that stage they try to make bigger the market or sphere of business that they operate on. To make that, companies start some kind of collaborative relationships among them. As the additional value was created, companies start to be rivals to capture the biggest part of this additionally created value on their own. As a result there is an increasing chance to create a common win-win situation for the whole industry for all its participants through a larger market creation (Liu, 2013).

The origin of a coopetition as a concept of interfirm business model is not clear. From one stand point it could be derived from the game theory and stands on the idea of real-world games with mixed motives of players (Mariani, 2007) and potentially the principles of coopetition were described far before the term was introduced and accepted by academics. From another position, which tends to be more popular among academics, coopetition first was used and described at some extent by Raymond John Noorda who talked about contemporaneous cooperation and competition among organization (Zhang and Frazier, 2011). However even though the term was introduced to society in 1980/90s, coopetition as a field of actual academic research was first described and analyzed by Brandenburger and Nalebuff as a new set of principles for interaction among organizations in terms of alliances. It is considered that book Co-opetition (Brandenburger and Nalebuff, 1996) became the initial starting point, after which scholars and business world started to pay attention to the coopetition as a potential strategy of interaction among companies.

One of the argumentations “For” coopetition as a choice of inter-firm relationships that have a potential to capture additional value is the resource-based argumentation (Lavie, 2006). One of the general strategies used in terms of alliances is to use supplementary and complementary resources in an integrated way. Such approach has a potential to create more value comparing to the cases, when above-mentioned resources are used separately. This additional value could be expressed in innovations, differentiation of organizations, cost reduction, expansion of the market, cooperative manufacturing and distribution of products. Another potential field of coopetition-based type of interaction between companies that stands on the idea of resources is their utilization. Through cooperation organizations manage to create an additional value through cooperative utilization of their resources. At the same time they manage to capture some individual portion of Joint-created values through the utilization of their

specific resources (Ritala and Hurmelinna-Laukkanen, 2009). Nowadays coopetition velocity increases dramatically, which can be proved by recent researches in ICT sector (Basole, Park and Barnett, 2015).

Later there appears classification of business activities, dividing them by the “aim” in terms of coopetition, dividing them to downstream (or output) activities and upstream (or input activities). Upstream activities are those which are dedicated to “create a bigger business pie”. In other words they can be called cooperative. These are common research investments, collective buying of raw materials or services (with discounts) and other activities that make all industry to grow. Downstream activities are based on the competition part of coopetition. This is marketing, branding, pricing and other activities that make one company to get a bigger part from the common “pie”. As a result there is an attempt to classify coopetition cases by the criteria of competition and cooperation degree in their coopetition relationship, which led to the following typology (Bengtsson and Kock, 2000):

1) Upstream-dominated relationship: In such type of coopetition organizations put into the top corner “cooperation” as a main driver of interactions.
2) Downstream-dominated relationship: The main driver of interaction among organizations in such type of coopetition is a competition among participants of the process.
3) Equal relationship: Competition and cooperation components stay in some kind of balance and considered as equally important by participants of coopetition

At the same time coopetition has some potential problems for companies. There are some risks for opportunistic behavior (Brandenburger and Nalebuff, 1996), when participants can act selfishly when particular circumstances provide them a chance for this. This can be connected with knowledge expropriation, breach of trust and etc.

There are some proves to the issue, that coopetition can potentially provide small and medium enterprises (SMEs) with added value, cost reduction and other factors, which could be a good growth and development opportunity for the company (Thomasona, Simendingera, and Kiernanb, 2013). That comes from the statement, that because of the size of these companies, they have a number of issues, which can be a serious barrier for their development. These limitations could lie in the field of resources, market presence, current workforce capabilities. One of the possible solutions of problems that come from these limitations is a coopetitive form of interaction between firms. Starting coopetitive relationships companies get a chance to boost their competitive position, benefit from the improvement of resources available to them, and start

some international projects. At the same time coopetition starts to be used by SMEs from the perspective of management of their potential risks (Morris, Koçak and Özer, 2007)

If we analyse motivation of companies to enter coopetitional relationships with other organisations, there is one of the main reason, why companies do this – improvement of their competitive positions. This could be reached through inter-organisational learning practices and reception of valuable and strategically important resources from such inter-actions (Luo 2004). However these are not the only way of competitive position improvement. There are many examples such as (Garrette, Castaner and Dussauge, 2009; Tong and Reuer, 2010; Rothaermel 2001; Koh and Venkatraman, 1991):

- Adaptation of partners experience and knowledge: When organisations enter close relationships (as coopetition or cooperation) they enter a common "knowledge pool". Participation in such pool gives them a chance to obtain some knowledge and experiences from their competitors;
- Common establishment of new knowledge: Through coopetition organisations are able to combine their creative skills to generate some new knowledge, which can be used by a particular coopetition group. Such knowledge provides all members of this group with additional competitive advantage;
- Joint research and development: Entering joint R&D projects companies get a chance to manage risks and increase budgets of research activities;
- Defence from innovations (radical ones) that potentially can damage a company: Getting in touch through coopetition with key competitors organisations can get an opportunity to protect their business from sudden appearance of radical innovations on the market. That could be reached through creation of common informational field, knowledge sharing and common R&D projects;
- Creation of entry barriers for newcomers and foreign competitors: Coopetitional inter-actions of organisations provide them with a potential to defend their territory with help of price, technology or market instruments;
- Getting cost reduction through the increase of scale of some operations that can be done in coopetition (upstream ones): For example, if five organisations make one order from a supplier of goods, they can get a sufficient discount and reduce their costs significantly.

International organisations can get into coopetition with its competitors as on local territories, where they try to expand their share, as on the global scale, running coopetitional inter-actions with global rivals. From the perspective of global growth and development

coopetition can help multinational companies to decrease risk level and reduce costs, that arise when company tries to expand on new markets. Entering coopetition organisations can even overcome some governmental barriers (Luo, 2007).

Cooperation with competitors in contrast with a cooperation with organisations that provide products and services, which differ from those, which are produced by a company has a potential, which rarely can be achieved through cooperation with the second ones (Garrette, Castaner and Dussauge, 2009). That is because of the different outcomes that each type of cooperation brings to organisations. In case of coopetition organisations get extra opportunities through resource addition effects, when organisations combine their resources to reach some bigger goals. That could be especially profitable when coopetitional group decides to enter foreign markets. Individually organisations can have some problems with manufacturing resources or lack some marketing force to enter a new geographical market. However, entering a coopetitional relationships with competitors, who have the same interests and face similar problems, organisations get an opportunity to start developing together on these new markets, simultaneously competing for a share from the new concurred territories (Luo, 2007). That stands on the idea that company can get its strategic market advantage not only using its own resources, but also getting accesses to power that other organisations have (through coopetitive relationships to them).

One of the ways how academic society tries to prove strategic potential of coopetition is a case analysis, of big international companies, which have already applied coopetition in their practice. In 2014 there was published an analysis of Amazon.com coopetition business model (Ritala, Golnam and Wegmann, 2014). One of the questions discussed in the paper is Amazon's Marketplace which became a platform where Amazon let its competitors, with the same products, so that clients could compare and make the best choice (which is not always Amazon). Also Amazon have started a program that helped its offline competitors to go online with their books. Logically these competitors also have joined Marketplace.

Even though in 2006 28% of products were sold by a third party, Amazon has demonstrated a three-fold growth of revenues comparing to the year 2000, when only 6% of products were sold by a Third-party through the marketplace. Creation of the coopetition platform helped Amazon to get out from the possible bankruptcy that looked pretty close in 2000, increasing profits of the company and attracting new customers. And commissions and subscription fees for competitors provided Amazon with guaranteed money, even if customers bought products from their competitors (Ritala, Golnamb and Wegmann, 2014).

Understanding coopetition and its potential from the perspective of value addition and profitability it is important to analyse and examine potential conditions that might cause effect on the process of formation of coopetition among companies. There are at least five issues that cause influence on this process:

Environment: Coopetitive strategy of organisations can be influenced by context in which these companies operate. This context can be described by the governmental policy, resources peculiarities, competition level, quality of services and others (Lado, Boyd and Hanlon, 1997). For instance in environment where companies have a high probability of intervention from abroad, organisations will have a motivation to cooperate to protect their market and at the same moment of time to compete for the market that they defend. In such case organisations have more motivation to cooperate, so coopetition starts to be up-stream dominated. As an opposite, if organisations face the situation when there is a little possibility of intervention, there is a chance that companies start to compete more than cooperate.

Nowadays many industries face a dramatic growth of competition due to such factors as internationalisation, innovation growth, internet development and etc. As a result organisations have to find solutions, how to fight uncertainties that arise from such situation. That brings competing sides to the idea of cooperation with each other (Burgers, Hill and Kim, 1993).

As an example, when companies face a problem of innovations that have a potential to change the whole market and cause effect on the choice and reactions of customers, cooperation among rivals can move its focus to the question of adaptation of organizations to the quickly changing environment. Doing this together companies increase their chances to succeed and stay on the market (Burgers, Hill and Kim, 1993).

Coopetitional costs: Entering a coopetition with other organisations, company has to pay attention to the fact, that occasionally such relationships cause some additional costs to arise (coopetitional costs). Such costs appear due to increasing complexity of relations that come from growth of participants (Lado, Boyd and Hanlon, 1997). As coopetition involves a cooperative component, it is possible to assume that some concepts of cooperation theory are applicable to coopetition concept. Cooperative theory describes costs that arise when companies try to maintain the cooperative relationships and potential losses connected with an opportunistic behaviour (Das and Teng, 2000). All these issues definitely can cause some effects on the form of coopetition among organisations. It is vital for organisations, to get overwhelm these costs with incomes and value that coopetition that they enter can bring to them. Due to this, companies probably have to think, which benefits such coopetition should bring to them.

Size of companies: Small and large organisations statistically are less interconnected with their partners comparing to the medium-sized organisations. Due to the tendency that small companies usually niche ones, they do not have enough power and competitive potential to cause any influence on their industry or alliance that they enter. Situation around large organisation is affected by the antirust policy of modern governments, which put relations among big companies under a strict monitoring and try to coordinate them. Also it is important to admit, that big international organisations have access to much more resources in comparison with SMEs, as a result motivation to cooperate among these organisations decreases. Medium companies at the same time already have some possibilities to cause some influence on their industries, but still are not big enough to face all difficulties connected with market turbulence alone. That makes intermediate companies an ideal subject for cooperative relationships (Burgers, Hill, and Kim, 1993), and potentially make coopetitive inter-actions at lease potentially interesting for them.

How coopetition effects on the competition on a particular market? That question is examined mostly from the perspective of how cooperation influences on the market. However there are also some researches made in coopetition context (e.g. Oxley et al., 2009).

Different researches provide quiet opposite data. While one group of researches provide us with the information and evidence, that cooperation among organizations reduces the degree of competition on the market (Tong and Reuer, 2010). Another group of scientists state that cooperation and coopetition cause an increase of competition on the market (Gnyawali, 2006). Common research and development programs (widely announced on a particular market) also cause some positive affect on the particular market value, not only on members of coalition, but also on other companies, that do not enter this coalition. Basing on this research authors state that there could be observed an increase of prices of shares of companies that do not enter an alliance could be a result of expected decrease of competition on the market (Oxley et al., 2009).

Basing on the assumption, that coopetition can be risky, companies that enter it, can have some problems with the trust-building issues. Some sources and researches suggest that the most significant role in the trust building process goes to a calculative process (Faulkner, 2000; Lewicki and Bunker, 1996). Dyadic coopetition depends mostly on the cost-benefit analysis. Absence of benefits that individual can calculate makes other trust-building mechanisms not sufficient for starting some kind of coopetition. Emotional base plays some kind of moderating role. Reputation based trust decreases opportunistic risks, but tends to be not sufficient enough for the coopetition decision procedure. Analysis of potential partner capabilities tends to be a part of the cost-benefit analysis (Czernek and Czakon, 2016). However the problem of trust

could be potentially avoided if there would be no potential interactions between participants of a coopetition. Instead of this organizations could interact with a third party, whose main interest would be a coopetition as it is. That party could have its interest from the additional value that was gained through a coopetition. That makes this third party potentially more credible than other participants of alliance, who can try to get their profit with cheating.

One of the potential sources of coopetition concept is a game theory, there is a number of researches and theories that observe coopetition from this (game theory) perspective. One of these demonstrates how coopetition among competitors brings both a chance to get high profit calling it "coco value" (cooperative/competitive value) through game theory and minimax strategy (Kalai and Kalai, 2012). According to this research coco activities bring the most profitable result for both sides, even in cases of Bayesian games, when organizations have incomplete information concerning characteristics of other players of the game. Nowadays topic of coopetition in game theory tends to be an emerging one and seems to have a big amount of research gaps.

1.3 Cooperative game theory

In terms of current research author does not try to develop or tests any concept of the game theory. However many principles and concepts (such as game partition or coopetitional games) help author to build mechanisms and ideas, described in the following chapters.

The game theory was described and introduced to society as a mathematical tool for a strategic planning in 1928. That was done by John von Neumann in his article "On Game Theory". In this article Neumann describes basic principles of matrix games. Later in 1944 Neumann being co-authored by Oskar Morgenstern publishes their book "Game Theory and Economic Behavior" (Von Neumann and Morgenstern, 1944).

The game theory tries to combine principles of and concepts of philological field of knowledge with mathematical methods of analysis and modelling of strategic decisions. That makes it interesting not only from the perspective of science and pure theory, but also to be a powerful tool for leasers of governments, politicians, business owners and ordinary people. However the game theory works with an assumption that each participant of the game makes the most rational choice (basing on some grounds principles) (Von Neumann and Morgenstern, 1944). Otherwise games become unpredictable and these cases refer to other fields of knowledge.

One of the most widely discussed topics of the game theory is the “Prisoner’s dilemma” (Gilbert, 1996). The main idea of the game it that two bandits are arrested, separated, and suggested to provide some evidence against each other. As a result bandits have a choice:

- If both provide evidence against each other, both get average prison term,
- If both do not provide any evidence, that both get minimum prison term,
- If one provides evidence against the second one, and the second one does not provide evidence against the first one, the first one gets freedom, and the second one gets the maximum prison term

It is accepted, that such type of game is a non-zero-sum game. That means that this is a game, when decision of one player does not mean that second player losses or wins necessarily. There is always a chance for a win-win situation, when a group gets maximum pay-off (Binmore, 2007).

The best (dominant) strategy for both bandits is to betray each other and get medium term. Even though cooperation has a greater potential for both (if we evaluate an pay-off of the group), it is the most risky option, while non-cooperation means that each bandit gets his result out of two options, where each option is not the worst one (Gilbert, 1996).

There are several ways and approaches how to solve these games, however one of the most often used ones is Nash equilibrium. Actually this is a generalisation of minimax strategy suggested by Neumann in 1944 in his book (Kelly, 2003).

The main concept of this approach is that each competitive game with a final has at least one equilibrium solution. Nash equilibrium is the situation, when each participant of the game chooses the solution, which maximises potential pay-off of this participant (when all participants know all possible decisions of other players). However such situation is possible only if all participants of the game take their decisions rationally, applying all knowledge and data that they have. The main goal of such players is to maximise their own profit (Nash, 1950).

The common concept of Nash equilibrium is widely used in the game theory to resolve different games. For example equilibrium of Prisoner’s dilemma by Nash is a non-cooperative strategy for both bandits. Standing on the idea of maximisation of a pay-off that a particular individual gets. Nash equilibrium is not widely used in games that try to describe cooperation. However, for these games there are analogy, such as “the core” concept (Parrachino, Zara and Patrone, 2006).

All games described in the game theory can be divided into two main categories (see Fig. 1.1).

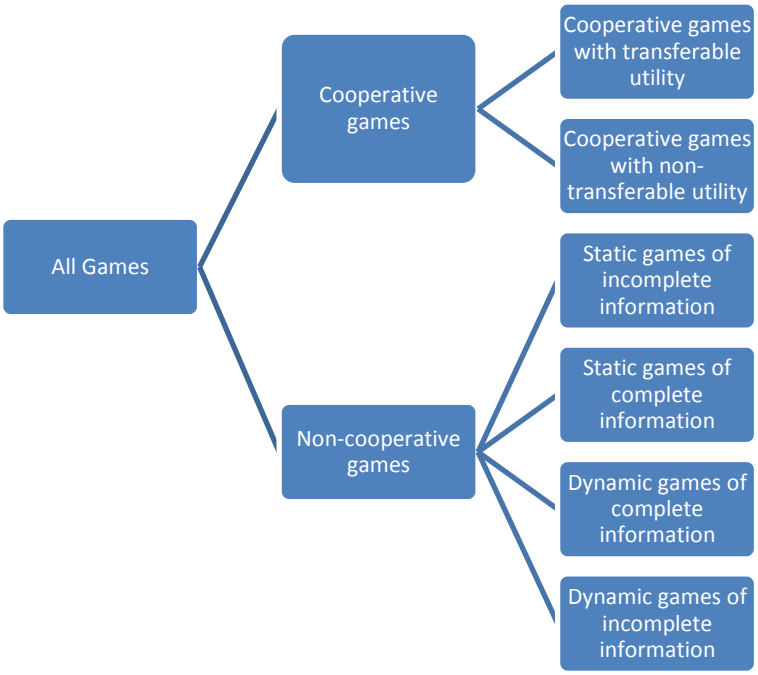


Figure 1.1 - Classification of games (Gibbons, 1992).

The first category is a non-cooperative games (such as Prisoner's dilemma). The second category of games is a Cooperative games, which tries to describe inter-relations between companies that try to organise some kind of coalitions or alliances (Gibbons, 1992).

As it was mentioned befor games that describe cooperation deal with coalitions or alliances, that players organise in the game process. As a result main decision makes in such type of games is a coalition. Players in terms of such games are allowed to make agreements that regulate the procedure of pay-off distribution among all players of the game (partitipants of the coalition).

Cooperative games are also called coalitional games due to the fact that in cooperative games a coalition makes the decisions about the strategies to be chosen instead of individual players as in non-cooperative games. In cooperative games the players can also form binding agreements about the division of pay-offs (Harsanyi and Selten, 1988).

There is also a subdivision among coopartive games to two types of coopeartional games:

- Games with transferable utility: This type of games describes situation , when one player can transfer its utility to another player not facing any kind of loss. In this case researches do not estimate the income of each particular person, but work with the utility of the whole

coalition. In another words transferable ulility means that it does not matter, who exaclty gets utility in the coaltion, and how many transerts of this utility were made. In all situations total utility of the alliance remains the same.

- Games with non-transferable utility: Such typpe of games suggests that players cannot transfer utility that they get between other players of the game (paritipants of the coaliton) (Harsanyi and Selten, 1988).

In cases of Non-cooperative games there are four sub-catergorites, which can be derrieved basing on two main criteria: static/dynamic games, how much iformation each palyers has about other players (Gibbons, 1992):

- Games with a complete information: In this category of games all players have al information concearning each player of the game. This knowledge also includes a pay-off fuction infromation (for each partiticiapnt of the game).
- Games with an incomplete information: This is the type of games, when players can not be sure that they have all information about other players. That also means that they cannot be sure about a payoff fuction of other participants of the game.
- Static games: This is a category of games, when all paritcipants make their deciisons (choose their strategies) at one (the same) particular moment of time. In other words, that make their choice simmutaniously. That means that there is not information concearning any actions, that were done before (in terms of this particular game), because there were not actions in the past.
- Dynamic games: In terms of such games players have some information about some moves and actions that were done before the moment, when they haave to do their choice. The other name for such type of games is a “sequental games”.

However, the abovementioned typologi is not the only one, that is applied in a scientific field. There are many claissifications that help to understand, which particular game we analise. There are only some of the examples of such classifications:

- Number of persons claissification: Following this classification we devide games to two-person and n-person games, where n-person games are those, where number of players is more then two (Davis, 1997).
- Number of repetitions classification: There are two main categories that come from such classification: games with infitine number of repetitions or finite number of repetitions (Osborne, 1994).

- Sum-based classification: When researcher uses this classification he chooses between zero-sum games and non-zero-sum games. Key determinant of this clasification is the question whether pay-offs of particiapnts are balanced, so that if one wins something, then secon looses (zero-sum), or there is a chance for win-win option (non-zero-sum) (Binmore, 2007).

Current research deals with the coopetition which deals with cooperation as one part the coopetition concept. That makes cooperative games to be a potential source of information, rules, principles and instruments, which can help us to analyse coopetition from the perspective of the game theory.

As it was mentioned before non-cooperative games describe the situations, when players choose their strategy from the perspective of individual profit and pay-off maximization. Cooperative games in contrast with the first ones operate with a pay-off of the coalition, its strategies and rules an principles how players dive pay-offs from the particular game (Harsanyi and Selten, 1988).

In non-cooperative games equilibrium, point is often defined with the help of Nash equilibrium instrument (when players try to maximise their profits), while equilibrium of a cooperation games lies in the field of definition of a stable pay-off distribution principles. These principles should be accepted by all members of the coalition. This is how equilibrium in cooperation games could be reached (Peleg and Sudhölter, 2003).

Cooperation games stand of the obligations that parties (players) take when they enter an alliance. That is very similar to the real-world agreements that have also some punishment for those who break them. These obligations should be accepted by participants of the game, otherwise no coalition will be formed, and as a result there will be no game at all. That means, that even though cooperation games deal with strategies of the coalition, they also pay attention to the preferences of each player (on the game creation stage), so that players would be interested in participation in this game (Peleg and Sudhölter, 2003).

As a result there is a big focus on the principles how pay-off generated in terms of the game is distributed between participants. That brings following questions to the top importance positions in the cooperative game theory:

- What coalition can be formed?
- How profits generated by a coalition can be divided?

The first question is also discussed from the perspective of, “What principles should be applied for the coalition partition?” (Parrachino, Zara and Patrone, 2006).

As it was described previously there is a division of cooperative games to transferable and non-transferable utility games. In transferable case participants can exchange with their pay-offs without any loss from their side, or from the perspective of a coalition. Usually these pay-offs are represented by money, which occasionally are evaluated equally by all players. However these transferable utilities can also be represented with other instruments (for example, there could be used some derivatives of money) (Peleg and Sudhölter, 2003). Non-transferable utility games are not going to be used in terms of current research, and as a result will not be analysed deeply in current theoretical background description.

Now let us describe common principles of coalitional games using mathematical instruments. Occasionally in the game theory literature set of players that take part in the game is shown as N, where $N = \{1,2, \dots, i, \dots, n\}$, where i is a current player and n is a number of players. N is also called as a grand coalition. The characteristic form of an n-person cooperative game is a pair (N, v) where v is a function that associates a real number $v(S)$, where S is a coalition that was organised on the base of N, and can be described as its subset $S \in N$. If there is no coalition, then $v(\emptyset) = 0$.

Coalition has an opportunity to distribute its total pay-off $v(S)$ in all feasible ways between the players that entered a coalition, that can be described as all payoff vectors $x \in \mathbb{R}^s$, which satisfy: $\sum_{i \in S} x_i \leq v(S)$

Each player of a coalition S has its marginal contribution, which can be described in the following way: $MC_i = v(N) - v\,(N \backslash \{i\})$, , where MC_i is a marginal contribution of a particular player. This is a value which each particular player adds to a coalition that he enters (Chakravarty, Mitra and Sarkar, 2015).

There are characteristics that occasionally are used to describe and classify coopetitional games (Gambarelli and Owen, 2004):

Superadditivity: If two coalitions join into one coalition, their value is not less than value, which they could generate if they acted on their own. $v(S \cup T) \geq v(s) + v(T)$, where $S, T \in N$, and $S \cap T = \emptyset$;

Monotonicity: If there is two coalitions, coalition with a more participants gets bigger value. $v(S) \leq v(T)$, where $S \in T$.

To define the most appropriate way of pay-off distribution there must be accepted some rules or agreements. They should be accepted by all participants of the game (otherwise there will be no game at all. Rules accepted by all participants of the game are usually called as "solution", or a "solution concept". These accepted solutions have some common principles, which are widely described in the academic literature (e.g. Parrachino, Zara and Patrone, 2006). Some of these principles are described below:

Let G be a set of games, i is a current player. A solution on G is demonstrated with a function f which associates with each game, $(N, v) \in G$ a subset $f(N, v)$ of $X^*(N, v)$, where $X^*(N, v)$ is the set of feasible payoff vectors for the game (N, v), and

$$X^*(N, v) = \{x \in \mathbb{R}^N \mid x(N) \leq v(N)\}$$

1) A solution f on G is rational from the perspective of individual player if $(N, v) \in G$ and $x_i \in f(N, v)$, then $x_i \geq v(\{i\})$ for all $i \in N$. That means that each player i entering a coalition can earn at least a pay-off that this player could get, if he acted solo out of the coalition. Otherwise the solution is not rational from the perspective of individual player, which means that this player has no interest to join a coalition N.

2) A solution f on G is efficient if $(N, v) \in G$ and $x \in f(N, v)$, then $x(N) = v(N)$.

Efficient solutions of the game satisfy the condition that pay-off of the coalition is totally distributed between all players. At the same time all individual vectors are efficient and players get at least $v(\{i\})$,

To proceed there must be introduced additional parameters: $MC_i^{max}(N, v)$ and $MC_i^{min}(N, v)$ the maximum and minimum marginal contribution of current player i to a coalition in a game (N, v).

3) Function f on G is efficient if following conditions for $i \in N$ are satisfied:

$((N, v) \in G \; and \; x \in (N, v) \rightarrow x_i \leq MC_i^{max}(N, v), and$

$((N, v) \in G \; and \; x \in (N, v) \rightarrow x_i \geq MC_i^{min}(N, v)$

That means that player can at least ask coalition to provide him/her with $MC_i^{min}(N, v)$, however there should be no chance to ask for a pay-off which exceeds $MC_i^{max}(N, v)$

If coalition sticks to these principles, there is a chance that game will be efficient. However that does not mean, that solution concept provides coalition with some one particular

strategy, how pat-off should be distributed. Occasionally it depends on the allocation principle chosen by coalition (Parrachino, Zara and Patrone, 2006).

Question pay-off of allocation remains to be opened, as there are many concepts, which try to organise allocation in some way. Some of these are: stable sets, core, bargaining sets, Shapley value. Each concept stands on its assumptions and principles of fairness, however, these principles are not universal, as a result, each concept is stable, only if we accept this or that principle of fairness (Chakravarty, Mitra and Sarkar, 2015). However, in terms of current research there is no need to go deep into each of these concepts.

1.4 Platforms and platform-based markets

Current study is concentrated mainly on design of a tool that could be used by internet platforms (e-platforms). E-platforms nowadays tend to focus on running business through the internet, and also could be called as pure-players. Pure players are the organizations that operate only in the Internet and do not have any physical stores or spaces (Sharma and Sheth, 2004).

Nowadays we face a significant growth of popularity of platforms that launch and maintain interactions between two or more parties (sides) (Caillaud and Jullien, 2003; Rochet and Tirole, 2003; Armstrong, 2006) – such as Airbnb, Amazon, and Uber.

In terms of current research internet platforms theory and concept of multi-sided market is used mainly to describe a tool (two-sided platform) that could be used as a base for the lead generating coopetition. That is why there is no description of mathematical models that try to describe business model of different internet platforms. The main idea of current paragraph is to provide a brief description of internet-platform business model and provide some examples and peculiarities of it.

These platforms manage to create value gain incomes from intermediation between different parties of users, satisfying their needs (Osterwalder, Pigneur and Smith, 2010). Occasionally sides that get into the focus of multi-sided platforms are business audience that provides market with some kind of services or goods, and customers that could be described as end-up users. The first group of users also could be called as advertisers (Rochet and Tirole, 2003).

The most part of researches admit that focus on more than one side if a relevant characteristic that describes modern industries in different extent (depends on the industry).

“Multisideness” became a new strategic tool, which is widely used by many organizations that manage to demonstrate significant results.

Two-sided markets work with the intragroup and intergroup network effects which are also called cross-group effect one of the definitions of which is: cross-group network effects occur. The benefit enjoyed by a user on one side of the platform depends upon how well the platform does at attracting users on the other side (Amstrong, 2006).

Basing on this we can see that YouTube could be called a two-sided internet platform which operated with the above-mentioned phenomena of cross-group effect, when its revenues from advertising depend on how regular video subscribers are satisfied.

Another significant example of a multi-sided platform, that is widely described in a literature is Amazon company, that moved from a simple retailer to the two-sided model, adding another retailers to its business process, and suggesting them to sell their products on the internet based platform, called Marketplace (Ritala, Golnam and Wegmann, 2014) and as it was mentioned before, Even though many of analytics tried to persuade Amazon, that such approach is too risky, today we can see, that that move became a significant step that gave the company (Amazon) a chance to survive and continue its growth.

Concentration on clients and on the market development (not on competitors), gave Amazon a boost for the further development, which gives it a chance and fuel to develop not only their own company, but the whole on-line industry, giving us a chance to propose that platforms, designed following the principles and goals of coopetition have a great potential to everybody.

Zhu and Iansity analyze entry barriers and success models on the platform based market on the example of X-Box experience. Basing on the regression analysis authors highlight indirect network effect as one of the key factors that gives a new platform a chance to stay on the market and increase the number of subscribers in a short term. Also authors purpose that discount factor can play a significant role in the platform market entrance. However its significance is twice lower than first factors influence.

Indirect network effect is the situation when the increase of use of one product or network spawns the value of the complementary product or network (Sundararajan, 2013). This term is also connected with the cross-side networks and two-side markets, that will be discussed later.

However it is necessary to highlight that authors suggest that even nowadays we face the decrease of the indirect network effect impact (especially in some particular spheres like web-browsers). Also it is necessary to pay attention to the fact that the research made in terms of limitations that make it hard to apply for many real case situations (Zhu and Iansity, 2012).

Basing on the research of platform market leader driven by Gezinus, Hidding,, Williams and Sviokla we can come to the conclusion that on the market of internet platforms first movers seem to be not in the best position, because usually followers take first places on this field. Also in their analysis of platforms authors highlight for main drivers of current platform popularity (Hidding, Williams and Sviokla, 2011):

- Modularity;
- Increased interconnectivity;
- Self-organization;
- Low marginal cost of production, which makes the advent of two-sided markets more prevalent.

That drives us to the idea that any new platform that wants to succeed on the market needs to have all these four characteristics, and also ideally should not be a first mover on its field, so that customers would already be aware with some core functions and services that this platform provides them.

One of the key questions of internet based markets that focus on more than one side is to determine, which of the sides provides a more significant contributions to demand of its complement (the other side). In other words there is a question, why parties might join the internet platform. As a result we can meet the idea that consumer side sees as a motive any benefits and additional values that are offered by Internet platform.

At the same time, producer side has motives that are mainly linked to the number of potential customers that are classified by this business as a target audience. Second possible reason for service providers to start being a user of some platform is a possible usefulness of information and data that could be collected from its audience. As an example of the second reasoning there are some proofs that B2B companies that tend to be involved in two-sided markets usually get benefits from the private data, that their consumers leave on platforms they use (Fish 2009). One of the possible outcomes from such information could be a well-concentrated advertising, those bases on the personal information (age, gender etc.) of users of such social networks as Facebook.com or vk.com. This information could be used to define whether some person could be a potential user of some services or not.

One more significant peculiarity of multi-sided platforms as a form of business model is that usually on of the sides is not charged for the value, that it gets from the platform. Occasionally end-up users category (customers) is not charged for platform usage (that get some services of the platform for free), while business participants that intend to sell their product or to get some valuable data act as subsidizers paying to reach their target audience. That means that platforms need to find and demonstrate a good reason for end-up consumers to join the platform for free, so that there could be created a significant value for services and goods suppliers (Mahadevan, 2000).

Abovementioned peculiarities connected with the value creation issue for two different groups of users, pushes the most pert of internet platforms to the business model that consists from a set of steps. Movement from one step to another demonstrates the evolution of a business model that seems to by typical for many successful internet ventures (Muzellec, Ronteau and Lambkin, 2015). On early stages internet platforms concentrate on the values proposition towards end-consumers, persuading them to join a platform. At this stage platforms usually ignore any other sides. That continues until the number of users of a platform reaches some kind of critical mass that could become interesting for B2B clients of the platform.

At the second stage of development platform moves its focus on business that is interested in end-up customers, which were already attracted to the platform. At this stage platform starts to get its first revenues. After venture reaches its first financial goals it moves to the third stage, which could be characterized as a reconsideration of all its services it order to increase the value for both sides of their users. Authors call this business model as B2BandC oriented model (Muzellec, Ronteau and Lambkin, 2015).

1.5 Research problem, objectives and delimitation

Research gap. Nowadays coopetition is discussed mainly from the disruptive perspective, of how some organisations manage to run it. However, it seems to be difficult to find any research materials, which would attempt to create some kind of a practical coopetitional framework that could be applied. Also coopetition still remains to be poorly discussed from the perspective of impacts, which it potentially can cause on the scale of an industry. Today it is mainly analysed from the perspective that evaluates effects of coopetition on a scale of one particular company.

Delimitations. It was decided to concentrate on one group of marketing activities that seems to be common for nearly all commercial organisations. This is a lead generating group of

activities, which is connected with the procedure of getting potential orders or requests on services of a company (leads).

Also it was decided to reduce the scale of the research and its problems, from the whole market to one particular industry. The choice of industry based on the personal professional experience of the author and availability of the information that describes this industry.

The main research question. What impact can be caused by a lead generating internet platform-based coopetition among companies, which operate in one industry, on this industry?

There is a set of sub-questions that need to be answered:

2. What is a potential design of a lead generating coopetition process among companies, which operate in one industry?
3. What is the possible impact of a lead generating coopetition on companies with different price and quality strategies?
4. How the number of the coopetition process participants influences on effectiveness of lead generating coopetition?
5. How the number of the coopetition process participants influences on average utility that clients get?

The goal of the research. To define potential impact that can be caused by a lead generating internet platform-based coopetition among companies, which operate in one industry, on this industry. To reach this goal there was defined a list of objectives:

- . Creation and description of a design of a lead generating internet platform-based coopetition;
- Detection of a potential impacts of the suggested lead generating internet platform-based coopetition on individual participants of market with different price/quality strategies;
- Identification of a possible impact of number of the lead generating internet platform-based coopetition members on the effectiveness of the lead generating internet platform-based coopetition;
- Definition of effects that number of the lead generating internet platform-based coopetition participants can cause on an average utility of clients of industry, which applies lead generating internet platform-based coopetition.

In terms of the current research effectiveness of a lead generating coopetition is evaluated through revenue on advertising spent (ROAS) due to the assumption that many companies that try to generate leads spend some advertising budgets on such activities.

1.6 Research methodology and organisation of the study

The research starts with a description of different theories, concepts and methods that try to explain various fields of business connected with a coopetition and platforms. Basing on this theories and materials, described mainly in the first chapter (Chapter 1), author tries to generate a new mechanism.

The second chapter (Chapter 2) describes the methodology used in current master thesis. States the research gap, describes the method of, lead generating coopetition concept design, and finally discusses a simulation of an agent-based model used to define potential impact of lead generating internet platform-based coopetition on one industry with one product.

Design of this lead generating coopetitional mechanism is described in the third chapter of the study. The whole third chapter (Chapter 3) is used to reach the first objective of current research. Author designs a concept of lead generating coopetition using some instruments from cooperative game theory and self-designed mathematical formulas. However it is important to admit that this mechanism is only a concept that needs to be checked and tested.

The fourth chapter (Chapter 4) describes the agent-based model and analysis of its simulation results. Parameters for the simulation are taken from the research of the real web design market of Russia. Parameters from the real world are used to make simulation more realistic. Terms, parameters and analysis of results of the simulation are used to accomplish second, third and fourth objectives.

Finally there is a discussion of results of current research, provided in the last fifth chapter (Chapter 5). Also the final chapter contains limitations, discussion of further research questions that arise basing on current research, managerial and theoretical implications of this master thesis.

1.7 Summary of Chapter 1

1) The first research gap lies in the field of design of practical coopetitional concepts and strategies. The second research gap is an issue of potential industrial impact of coopetition.

2) The goal of the research is to design and define potential impact of a lead generating coopetition among companies, which operate in one industry, on the base of internet based platform. Author tries to reach answering following questions: What is a potential design of a lead generating coopetition process among companies, which operate in one industry? What is the possible impact of a lead generating coopetition on companies with different price and quality strategies? How the number of the coopetition process participants influences on effectiveness of lead generating coopetition? How the number of the coopetition process participants influences on average utility that clients get?

3) The research is organised in the following way. First author describes a concept of lead generating internet platform-based coopetition, using mathematical instruments and instruments used in cooperative game theory. Then author describes an agent-based model and runs its simulation, to evaluate potential impact of designed concept on industrial level.

2. RESEARCH DESIGN and METHODOLOGY of LEAD GENERATING INTERNET PLATFORM-BASED COOPETITION STUDY

2.1 Starting point of approaching lead generating internet platform-based coopetition study

There is a growing number of researches that describe coopetition strategies of different organisations operating all around the world. Such papers provide a deep analysis of actual activities made by these companies and provide some financial and statistical data as a proof of a potential benefits underlying coopetition phenomenon (Lacoste, 2012; Eisenhardt, 1989).

The phenomenon of coopetition arises various questions such as trust building among organisations or security of companies that choose a coopetition as a strategy (Czernek and Czakon, 2016; Pellegrin-Boucher et al., 2013). Also academic literature demonstrates various attempts to classify different coopetition strategies, types and activities through analysis of actual experience of organisations (Rusko, 2011).

As a result, nowadays experts try to design, create and describe various coopetition tools and instruments. To confirm the potential effectiveness of such instruments academics use experience from other fields of knowledge, such as game theory (Kalai and Kalai, 2012).

To define the first research gap, it is important to admit that the number of researches that provide companies with tools “How to run coopetition” is much less than papers that try to describe this phenomenon or classify it.

Also researchers focus mainly on coopetition effects in the scale of one company. As a result, nowadays there is a deep understanding of “What individual companies can achieve from a coopetition” (e.g. e.g. Song and Lee, 2012; Shih et al., 2006; Salvetat and Ge´raudel, 2012). However, due to the fact that even though coopetition starts to emerge as a strategy, it still remains not so common practice. As a result there are few possibilities to explore effects, which coopetition is able to bring to the whole particular market or industry.

One of instruments, that could be used as a base for a coopetition as a strategic tool for the whole particular industry is an internet based platform. The phenomenon of internet platform (e-platform) is a modern one (Armstrong, 2006). Its current popularity became possible with a rapid development of internet all around the world. The most frequent type of internet platforms is a multisided platform, which provides services for different (usually interconnected) groups of users.

Due to its mechanics, internet based platforms already started to provide services for competing companies. There are many types and forms of services, which are provided at this moment of time. There are even come examples of platforms that operate on the principles of coopetition (Ritala, Golnam and Wegmann, 2014).

At present moment of time, question of a coopetition strategies, that could be ran through platforms is examined from the descriptive point of view with the means of case analysis tools. However questions of possible influence on some particular industry of one of coopetition strategies organised on base of an internet platform is not examined as it could be and could be also classified as a research gap. Filling this gap could be valuable as from the perspective of academic knowledge, as from the practical usage of coopetition strategies in modern economy.

2.2 Design of a concept

To design of a concept of internet platform-based coopetition among organisations with a base upstream activity aimed at the generation of leads, author uses induction. Author uses theoretical description of three phenomena of modern economy, business and strategy environment: coopetition, cooperational game theory and internet two-sided platforms.

Combining principles of these three fields of knowledge author comes up with a concept of internet-based platform, which could be able to organise lead generating coopetition among organisations, which operate in one industry. After the design is done, author has to answer following questions:

- What is the possible impact of a lead generating coopetition on companies with different price and quality strategies?
- How the number of the coopetition process participants influences on the effectiveness of lead generating coopetition?
- How the number of the coopetition process participants influences on average utility that clients get?

2.3 Agent-based model simulation

To answer the abovementioned questions it is needed to evaluate possible outcomes of a complicated system functioning. Such outcomes tend to be hardly evaluated and predicted with simple mathematical calculations. Also it is important to pay attention to the fact that possible outcomes of such system functioning depend on various decisions of different participants of a

market (competitors, clients). Abovementioned conditions tend to be reasonable grounds to take a simulation of agent-based model as a way to test effectiveness of a suggested concept of competition interaction.

Simulation is used mainly in researches, when complexity of examined systems becomes so high that basic simple calculations are not enough to get some significant results. In academic researches simulation is described as a problem-solving method (Banks, 2000). The main idea of simulation is to build a model, which could be able to describe real processes at some extent (Law and Kelton, 2000). One of possible applications of a simulation is a prediction of possible results of processes with different values of variables.

To run the simulation a model is required. In terms of the current research author uses agent-based modelling (ABM). The main component of ABM is the "agent". The whole simulation in case of AB modelling bases on functions and parameters of agents, that define what they are, what they do and how they behave (Wooldridge and Jennings, 1995). In ABM agents get some set of rules that define their:

- Boundaries - their limitations, interconnections with other agents and etc;
- Behaviour and decision-making capabilities – describe how agents make their choice under various circumstances.

AB models describe the interactions of various agents that are situated in different situations and receive some programmed inputs concerning the state of environment and different agents. When agents get these inputs, they respond basing on some logic. Actions of agents of ABM can be reactive and proactive, basing on their objectives, environment and rules of a model (Wooldridge and Jennings, 1995).

In other words AB modelling operates with the modelling of the behaviour and interactions of various agents with different objectives and parameters, in an environment defined by some set of rules and principles, over time. It is important to pay attention to the fact that agents can act on their own basing on their personal goals, or share some common goals, acting in an organisational context (Jennings, 2001).

There is a string view that AB modelling suits the best, situations that run without or with a small influence of central coordination on the behaviour of agents. In other words agent base models are used to simulate bottom-up problems and cases, when behaviour and decisions of individual agents can cause some global effects and trends (Macy and Willer, 2002).

2.4 Limitations of the model

In terms of the current research there is a number of terms and limitations that make it possible to build a simulation that could be used as a base for some conclusions and further analysis.

1) AB model built in terms of current research assumes that there is only one product on one market, with no other goods, which could cause any effect on choice of customers;

2) There is only one advertising tool, used on the market – Pay Per click advertising. Other advertising and marketing instruments cause no effect on number of leads, that organisation gets;

3) Each client makes his choice basing on the principles of Utility maximisation;

4) Each client makes his purchase only once in terms of one simulation.

2.5 Data collection

When the model is described and built, it is important to set its parameters. It was decided to use parameters from the real world (from some industry that potentially could apply lead generating internet platform-based coopetition). it was decided to use Russian web-design market, due to the ready availability of data that describes this industry.

Basing on web-design market research conducted by the Russian analytical portal CMS magazine there was taken the following data:

- Number of companies that currently operate on Russian web-design market;
- Average turnover of web-design studios in different regions of Russia;
- Segmentation of companies basing on the price criteria;
- Identification of instruments that web-design studios use a lead generating tool.

There were two prior methods of data collection (CMS magazine, 2012):

- Questionnaire that was answered by 450 executives of Russian web-design studios (see Appendix 5);
- Data collected from 1234 organisations, basing on the profiles of companies registered on web-portal “Runet Rating” (in Russian Рейтинг рунета - http://www.ratingruneta.ru).

Basing on the information provided by Yandex Direct budget planning tool there was received information concerning Pay-per click advertising tool parameters and some information about the market potential (Yandex, April 2016):

- Cost per-click rates;
- CTR rates;
- Number of potential clients.

Yandex is a Russian search engine, which provides services of PPC advertising for organisations that try to find clients on the Russian market.

Statistics of conversion rates (CVRs) of web-sites of organisations from different spheres of business was taken from the survey made by online advertising company "WordStream" among 1,000 landing pages. There was analysed the statistical probability and its distribution (basing on the statistics of these landing pages) that people will leave their request on services, provided on particular web-page. Later this statistics was separated to different industries (Kim, 2014).

To define, which percent of total revenue organisations invest into advertising there was used a statistics provided by The CMO Survey in terms of the annual research of marketing trends. Information was taken from 3120 organisations that operate in different spheres of business. There was made an e-mail contact survey with follow-up reminders. As a result there was a 9.3% respond rate (289 respondents). Research was held from January to February 2016 (The CMO Survey, 2016).

Data, taken from the abovementioned sources was used to define the borders of key parameters that describe the environment and agents behaviour and characteristics in terms of current research.

2.6 Validation of the model

Before any data got from the simulation could be used as a base for some conclusions and analysis, it is important to validate the model. Validation of a model proves that a model is calibrated properly and is able to provide the data that at some extent could be close to the data from the real systems. One of the ways, how validation of the model could be made is to show it to the experts, who can examine it and say, that a particular model is valid. Such method of validation is called faced validation (Leemis and Park, 2012).

In terms of the current research the model was demonstrated to scientific supervisors who are considered as experts. The experts ensured that the behaviour of the model reflects to the reality to the level so that its results could be called sufficient and creditable.

2.7 Experimental design

Current research is based on the experimental design which tests the model with different parameters. Tests with various parameters provide author with the outputs, which are used by to detect trends, impacts and phenomena that could be used as a base for hypothesis testing.

The simulation of a lead generating platform-based coopetition evaluates the following outputs:

- ROAS: Revenue on assets spent by company (or coalition) on advertising;
- Profit: Difference between total income gained in terms of one simulation and money spent on advertising.

2.8 Simulation software

The simulation of a AB model in terms of current research is made on the base of a AnyLogic 7.3.1 Personal Learning Edition. It is a program based on Java program language that works with agent-based, discrete event, and system dynamics modelling approaches. The main reason for using AnyLogic is its availability. The version used by author is free of charge. Also AnyLogic provides its users with a graphic interface, which simplifies the process of modelling and simulation. Due to the peculiarities of this version of the software there are only two ways of distribution used to describe the parameters: union and triangular distributions.

2.9 Summary of Chapter 2

Current research goes through the following stages (see Fig. 2.1):

1. Author develops and describes the design of a concept of a lead generating internet platform-based coopetition (LGIPBC). It is done basing on three main theoretic fields of knowledge (coopetition, cooperation game theory and two-sided internet platforms);
2. Author designs an agent-based model for a simulation that helps to answer the second, third and fourth sub-questions of current research;
3. Author takes parameters for the designed model. It was decided to use data that at some extent describes Russian Web-design market of year 2012;

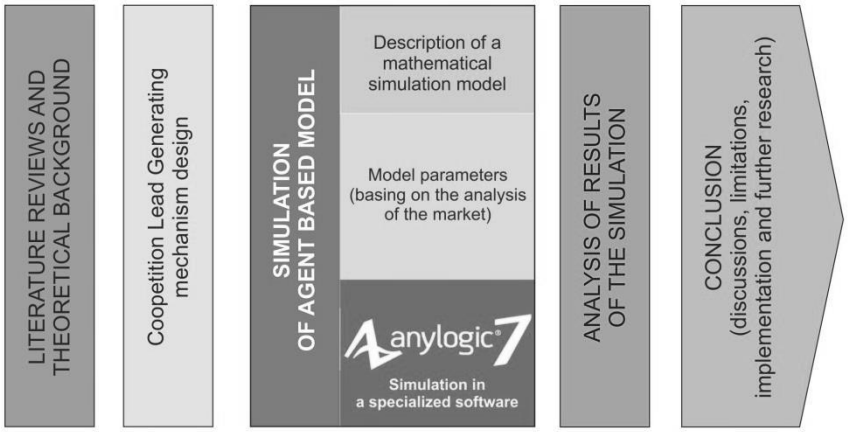


Figure 2.1 - The research structure

4. Simulations of the agent-based model (built on the following software: AnyLogic 7.3.1 Personal Learning Edition) with a parameters taken from the real market provides author with data, that could be used to reach second, third and fourth objectives;

5. Author analyses the data, that he gets from the simulations, and uses the results of the analysis as a ground for answer on the above-mentioned questions;

6. Finally there is a discussion of findings, potential implications, and limitations of current research.

3. DESIGN OF A LEAD GENERATING INTERNET PLATFORM-BASED COOPETITION

3.1 Description of lead generating internet platform-based coopetition

To answer the first sub question of the current research and meet its first sub-aim, author attempts to create a design of a lead generating internet platform-based coopetition (LGIPBC). This concept bases on the idea of co-invested advertising campaigns of the product. Companies, which distribute the same product, gather into coalition on the base of the internet platform (Operator). Operator provides coalition that gathers on its base a web-page and runs an advertising campaign on the advertising budget of the coalition. Advertising campaign generates traffic of potential clients on the web-page of the coalition. Generated traffic convers into requests for product distributed by members of the coalition (leads). Each lead, generated by a co-invested advertising campaign of the coalition, spreads among all members of this coalition, and after members of the coalition get lead, they start competing for it, with their sales strategies. Described concept includes competition and cooperation at different stages of their interaction process. That means that it can be classified as a concept of a coopetition among companies (Brandenburger and Nalebuff, 1996).

Operator charges members of a gathered coalition for its organization, coordination services and organization of the advertising campaign on the budget of the formed coalition. Operator offers companies that produce the same product to join one of coalitions. Coalitions base on groups of companies allocated by the Operator on the market of one particular product. Allocation of groups bases on characteristics of product distributed by companies on the market. Following characteristics could be used as a base for a group allocation process:

- number of functions;
- quality of design;
- price.

Operator also provides participants with a forecast of possible average price of one lead, that participants can get. Possible average price of one lead is inversely related to the number of companies that enter a coalition.

Each organization decides, whether it is ready to join one of announced coalitions or it rejects the offer made by the Operator. If organization accepts the offer than it needs to decide, coalition on base of which exact group it joins (basing on its own perception of its product and its strategy).

The main benefit that members of each particular coalition get is a decrease of average price for one lead. This is archived by the following mechanism:

1) Each company that wants to join a coalition pays an entrance fee of this coalition. Entrance fee is set by the Operator;

2) Total sum of the entrance fees, paid by members of the coalition is used by the Operator as an advertising budget;

3) Operator distributes advertising budget of a particular coalition on the advertising instruments that attract traffic of potential clients on the web-page of the coalition;

4) That traffic of potential clients converts to leads;

5) Operator provides all members of the colocation with a full access to all leads, generated by the web-page of this coalition.

As a result each member of the coalition gets leads that were generated on advertising budget of the coalition. Web-page of the coalition generates more leads with a cheaper price of one lead for one member of the coalition, if we compare it to the price of one lead generated by a solo advertising campaign led by one company for its own brand.

When participants of the coalition start getting leads, competition part of the LGIPBC begins. At this point everything depends on the specific features of participant's individual marketing policy, their sales systems, quality of the product and etc. After all leads are given to all members of the coalition, Operator stops the LGIPBC session and suggests members to join the next one.

There are three main stages of LGIPBC:

- Coalition partition stage;
- Co-invested lead generation (cooperating activities);
- Competition for customers.

As it was mentioned before Operator is an internet platform. The first group of users of this internet platform consists of companies, which distribute some product. The second group of users (second side) is represented by individuals and organisations, which could be potential customers of the first group of users of the internet platform. That means that this platform could be classified as a two-sided internet platform (Amstrong, 2006).

Basing on the conclusion that Operator is a two-sided internet platform, there are grounds for discussion of functions and services that could be provided to the second group of users (potential clients of the first group). However, in terms of the current master thesis, this issue is not discussed due to the fact that, from the standpoint of author, it does not refer to the coopetition in a straight way.

3.2 Coalitional partition stage

Coalitional partition is held among all companies that produce the same product (Companies) with different levels of characteristics that describe it. $N = \{1, \dots, i, \dots, n\}$ – set of Companies, n > 0, number of Companies, $i \in N$ – current Company.

Each Company i produces a product that can be descried in some way. Operator announces characteristics of this product (Characteristics). $\mathrm{R} = \{\mathrm{R}_1, .., \mathrm{R}_k, \dots, \mathrm{R}_r\}$ – set of Characteristics, r – number of characteristics. $R_k \in R$ – particular characteristic.

After a set of Characteristics was announced, Operator defines maximum and minimum levels of each Characteristic on the market of a product produced by the Companies (Market). Operator defines maximum and minimum levels of each Characteristic on the Market basing on the research of this Market: $M = \left\{\underline{LR_1}: \overline{LR_1}, \dots, \underline{LR_k}: \overline{LR_k}, \dots, \underline{LR_r}: \overline{LR_r}\right\}$ – Market. LR_k – level of a particular characteristic, $\underline{LR_k}$ – minimum level of a particular Characteristic on the Market, $\overline{LR_k}$ – maximum level of a particular Characteristic on the Market

After the Market is described, Operator starts to distinguish particular groups of Companies on the Market. That process is made in the following way:

1) Operator divides the market with the help of cauterization. As a result he distinguishes a set of groups: $\mathrm{G} = \left\{\mathrm{G}_1, \dots, \mathrm{G}_j, .., \mathrm{G}_g\right\}$ – set of Groups, g – number of Groups, G_j – a particular Group;

2) Operator defines border Levels of each Characteristic k for each particular group: ; $\underline{\mathrm{LR}_k^j}$ – minimum level of a particular Characteristic k in a particular group, $\overline{LR_k^j}$ – maximum level of a particular Characteristic k in a particular group;

3) As a result each particular group j out of a set of Groups can be described in the following way: $G_j = \left\{\underline{LR_1^j}: \overline{LR_1^j}, \dots, \underline{LR_k^j}: \overline{LR_k^j}, \dots, \underline{LR_r^j}: \overline{LR_r^j}\right\}$.

Each Company i on the Market can refer itself to one of the groups. It makes its choice basing on its own perception of Levels of Characteristics of its own product. $\mathrm{LR}_k(i)$ – perceptional level of a particular Characteristic k by the current Company i. As a result each Company can make its own Characteristic profile of its product (Profile). $CP_i = \{LR_1(i), LR_k(i), \dots, LR_r(i)\}$ – profile made by a current Company i.

Operator announces that on the base of each group j there can be formed only one coalition S_j. To enter a particular coalition j Company has to pay an entrance fee. Operator defines amount of entrance fee for each particular group j, $\mathrm{AS_j} > 0$, basing on the analysis of the Market.

After groups are defined, operator offers each participant to decide, to which group he refers himself. Each Company i makes its choice basing on its own perception of characteristics of their product.

Finally Operator announces the expected level of average lead price reduction PR from the perspective of individual investments $\mathrm{AS_j}$ of one particular member of coalition S_j for each coalition formed on base of a particular group j at different levels of coalition advertising budget.

$$PR_j\left(X_{S_j}\right) = \frac{X_{S_j} - AS_j}{M(X_{S_j})}\ , \tag{4.1}$$

where $X_{S_j} > 0$ – advertising budget of a particular coalition S_j,

$$X_{S_j} = \mathrm{AS_j} * \mathrm{d_j}\ , \tag{4.2}$$

$\mathrm{d_j} > 0$ – number of members of a particular coalition S_j.

Function $M(X_{S_j}) > 0$, describes a relationship between the amount of investments in advertising company and the number of leads that come from this advertising company. This function can be derived by many ways, one of which (but not unique) is a regression analysis. It depends on:

- Target audience of a coalition;
- Advertising instruments, used by coalition;
- Season, when advertising campaign is held.

Each additional participant that joins coalition j decreases PR_j. That means, that if there would be no competition increase, connected with the growth of the member of coalition members, it would be a wise strategy for Companies, to form maximum coalition, that could maximise the reduction of price of one lead for its members.

Operator uses PR_j as an additional motivation for Companies to enter one of coalitions. Basing on the researches of trust building among companies, there are some grounds to suggest that organisations make their choice whether they trust or no, mainly basing on estimations made with the help of calculations (Faulkner, 2000; Lewicki and Bunker, 1996). Level of average lead price reduction from the perspective of individual investments of one particular member of coalition PR_j is the instrument aimed to satisfy trust-building calculations criteria.

After all important information was announced, Companies decide, whether they want to join one of coalitions formed on the base of groups. If there are no Companies that join some particular coalition, than this coalition is not formed.

3.3 Possible strategies of companies

It is important to understand that each Company i has a right to join a coalition that bases on a group with , which does not meet characteristics of this participant. However, such strategy can reduce the number of leads converted to orders by this particular Company, because Levels of Characteristics of its services may not meet expectations of potential customers that can be gathered by a coalition, that Company joined.

From the perspective of the whole industry LGIPBC implies a set of possible strategies that could be chosen by Companies. At first each Company should decide if it wants to join a coalition or no. That means that company has to options:

- To join a coalition (Join);
- Not to join a coalition (Avoid)..

If Company i chooses to join one of coalitions, then it has to decide, whether it joins a group with a product, which characteristics levels are similar to characteristics of a product of this company (basing on its own perception), or to join another group. As a result we get the following options:

- To join a group of equals (peer group);
- To join a group with a higher characteristics levels (higher group);
- To join a group with a lower characteristics levels (lower group).

Finally, when Company decides to join a coalition and chooses which exact coalition it chooses, it should make a choice whether it invests its advertising money only into promotion of the web-page of his coalition, or part of its budget goes to advertising of its own web-site. This choice could be described in two options:

- To invest only into promotion of a coalitional web-page (all in coalition move)
- To distribute advertising budget among its own web-site and coalitional web-page (distribution move)

As a result we get the following tree of seven possible strategies (see Fig. 3.1).

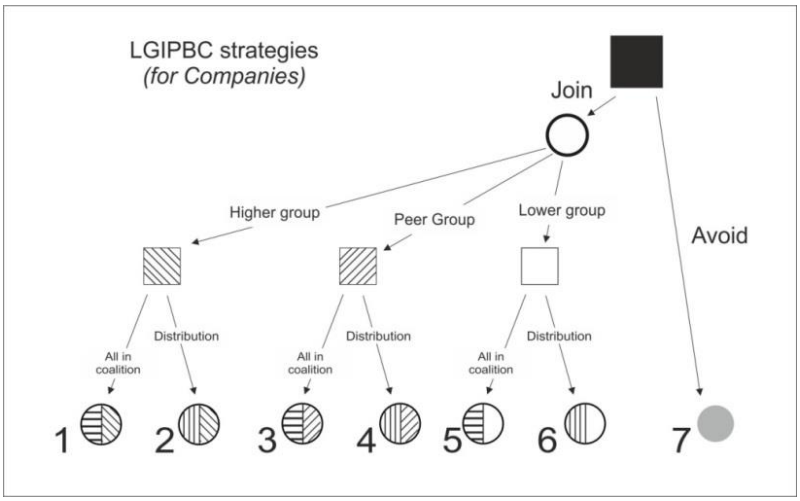


Figure 3.1 - Possible LGIPBC strategies for Companies

Depending, on LGIPBC strategy that Company makes it can potentially get different results. All these strategies are examined in mathematical simulation, described in fourth chapter.

3.4 Profit and ROAS – individual and coalitional

After coalition is formed, Operator starts an advertising campaign with a budget X_{S_j}, gathered from all entrance fees, paid by members of a coalition S_j. Each coalition gets its web-page that is located on the platform. This page gives a potential customer, to get an understanding, which companies entered each particular coalition, to decide, weather they are ready to send a request for services on the platform (for this coalition) or no.

When potential client leaves a request for services, each member of the coalition gets this request. At this moment of time, members of a coalition start competing for this particular lead, to convert this lead into a contract. This is the moment, when the LGIPBC starts to be competitive.

When advertising budget of a particular coalition ends up, and a flow of leads stops, there starts a process of evaluation of effectiveness of a LGIPBC session for each coalition and its participants.

In terms of current research effectiveness of each LGIPBC session is evaluated through two values: Profit and ROAS.

Evaluating profit $V(S_j)$, of a coalition S_j we take into account a total sum of investments that were spent on advertising campaign, and total income, from all sales, made by all members of a coalition, while an advertising campaign of this coalition was active.

$$V(S_j) = I_{S_j} - X_{S_j} \tag{4.3}$$

$V(S_j)$ – profit of a particular coalition S_j,

$X_{S_j} > 0$ – advertising budget of a particular coalition S_j,

$I_{S_j} \geq 0$ – total income, that one coalition S_j managed to get at the end LGIPBC session

$$I_{S_j} = \sum I_i^j, \tag{4.4}$$

where $I_i^j \geq 0$ – individual income, that one member of one particular coalition S_j managed to get at the end of a LGIPBC session.

It can be concluded, that each member i of a coalition S_j can evaluate only their own personal profits $V_i(j)$:

$$V_i(j) = I_i^j - AS_j \tag{4.5}$$

On the base of personal profit there is a possibility to calculate the return on advertising spends (ROAS) of each member of a coalition S_j:

$$ROAS_i(j) = I_i^j / AS_j \tag{4.6}$$

where $ROAS_i(j)$ – means the return on advertising spends of a current member of a particular coalition S_j;

Finally to evaluate the effectiveness of money spend on advertising campaign of a particular coalition S_j ROAS of each particular coalition should be calculated:

$$ROAS_{S_j} = I_{S_j}/X_{S_j} \quad (4.7)$$

Profit of each member cannot be announced or predicted before a LGIPBC session is not finished. These values depend on a number of factors including:

- Quality perception of clients;
- Current market trends;
- Economic situation in a country.

In terms of this research, there is an attempt to simulate client's behaviour to try to predict possible profits and evaluable potential successful strategies, that could maximise profits of coalition and each its participant.

3.5 Summary of Chapter 3

1) Lead generating internet platform-based coopetition (LGIPBC) includes three main steps: coalitional partition, when coalitions are organised; co-invested advertising lead generating campaign; and competition for contracts (companies try to convert leads into contracts). The first two stages can be classified as up-stream coopetition activities, while the last stage is a down-stream activity. All three stages are coordinated by an internet-based multi-sided platform (Operator);

2) Coalitional partition is organised on the base of market or industry grouping. This grouping is made on the basis of characteristics of a product of this market. Each group can have only one coalition. If company wants to join some particular coalition, it has to pay an entrance fee that depends on a group that used as a base for this coalition;

3) Organisations can choose between 7 main strategies, suggested by LGIPBC. These strategies stand on three main decisions: to join or to avoid a coalition, organised on the base of LGIPBC; to join a coalition organised on the base of group with quality higher, lower, or equal to quality of a company; to use LGIPBC as the only source of leads, or also invest into advertising of an own web-site;

4) Results of and effectiveness of LGIPBC are calculated trough profit (4.3), (4.5) and ROAS (4.6), (4.7) estimation.

4. MODELING AND SIMULATION OF LGIPBC

4.1 Model mechanics description

To estimate potential effectiveness of LGIPBC, there was used a simulation of an agent-based model. In current part there is a description of the model, used to run the simulation, its environment, behavior and parameters of its agents;

1) The model simulates market of companies that distribute only one product (Companies) with one possible coalition on this market $g = 1$ (S_1 = Coalition);

2) There is one company (i = *1*) all parameters of which are manually settable values (the Observed Company);

3) Number of Companies, which operate on the market $n \geq 0$ is a manually settable value, $N = \{1, \dots, i, \dots, n\}$ – set of Companies, $i \in N$ – current Company;

4) Number of clients on the market n$l \geq 0$, is a manually settable value, $nl \in NL$, $NL = \{1, \dots, l, \dots, nl\}$; NL – set of clients, $l \in NL$ – current client;

5) Number of companies that gather into Coalition $d_1 > 0$ is a manually settable value;

6) The value of coalition entrance fee $AS_1 > 0$ is a manually settable value;

7) The coalition gets its total advertising budget X_{S_1} is calculated according to (4.2);

8) Each Company (Coalition) chooses its own advertising budget $AB_i \geq 0$ for each period of time. In terms of the simulation, this budget is assigned on the basis of uniform distribution and falls into the range with settable borders, where $\overline{AB}$ is a maximum advertising budget and $\underline{AB}$ is a minimum one for the Market;

9) Each member of the Coalition has an advertising budget $AB_i \geq AS_1$. If $AB_i = AS_1$, than it means that a particular member of the Coalition invests only into the co-invested advertising campaign, and does not invest into advertising campaign of his own web-page. If $AB_i > AS_1$, than it means that a particular member of the Coalition invests money into advertising campaign of the web-page of the Coalition and also he invests into advertising campaign of his own web-page;

10) Each Company i gets its quality level q_i – an integer value that is randomly assigned on the basis of uniform distribution out of $Q = \left\{\underline{q}: \overline{q}\right\}$ – set of quality levels, $q_i \in Q$.

11) Each quality level q gets its middle price of a quality level ($MPQL(q)$);

12) When company i gets a particular level of quality, it also gets its price p_i, which is randomly assigned on the basis of uniform distribution and falls into the range:

$$p_i \in [MPQL(q) - \varepsilon * MPQL(q); MPQL(q) + \omega * MPQL(q)] \qquad (5.1)$$

where ε and ω fall into a range from 0 to $\gamma \geq 0$ is a manually settable value.

$\varepsilon \in [0; \gamma]$, and $\omega \in [0; \gamma]$ are randomly assigned on the basis of uniform distribution.

According to (4.9) there can be calculated maximum and minimum possible prices on the Market. Minimum possible price on the Market: $\underline{p} = MPQL(\underline{q}) - \gamma * MPQL(\underline{q})$, while maximum possible price on the Market can be calculated in the following way: $\overline{p} = MPQL(\overline{q}) + \gamma * MPQL(\overline{q})$;

13) Each Company has its own web-page;

14) The Coalition has its own web-page;

15) Each Company (Coalition) uses pay-per click (PPC) advertising as an advertising instrument, when advertisers pay a pay-per click cost ($PPCC \geq 0$), each time, when their advertisements are clicked;

16) PPC advertising is the only way of promotion on the market;

17) When potential client gets on the web-page that belongs to a particular Company (Coalition), that means that this potential client has clicked on the advertisement of this Company (Coalition), advertising budget of this Company (Coalition) reduces on $PPCC$, of this Company (Coalition);

18) There are four $PPCC$ rates, which are manually settable values;

19) In terms of simulation $PPCC$ is assigned to each Company on the basis of uniform distribution between the set of possible options. That simulates the choice, which each Company makes concerning, $PPCC$ rate that it uses;

20) $PPCC$ of the Coalition is a manually settable value;

21) Particular $PPCC$ defines the probability, that potential client will click on the advertisement of a Company that was assigned with a particular $PPCC$. That probability is called a click-through rate ($CTR > 0$);

22) Each Company starts its advertising campaign at a random period of time in terms of manually settable borders;

23) Coalition and Observed Company start their advertising campaigns from the beginning of the simulation;

24) Conversion rate ($CVR \geq 0$) defines a probability that a particular client, who has entered a web-page of a particular Company (Coalition), makes a request on its services. Each Company gets its CVR_i out of the CVR range according to the triangular distribution, where $\underline{CVR}$ – minimum possible CVR (manually settable value), $\overline{CVR}$ – maximum possible CVR (manually settable value), and CVR^m – the most possible (manually settable value);

25) CVR_{S_1} of the web-page of the coalition is a manually settable value;

26) When a particular client leaves a request on a web-page of a particular company, this company gets a status of "Potential contractor" of this client;

27) If a particular client leaves a request on a web-page of the Coalition, all members of the Coalition gets a status of "Potential contractor" of this client;

28) Each client l has his desired number of requests $NO_l > 0$, which he leaves on web-pages. NO_l is randomly assigned on the basis of uniform distribution to each client and falls into the range with a manually settable borders;

29) If client leaves a request on a web-page of a Company (Coalition) but he did not get his desired number of requests, he continues to visit web-sites of other Companies (but never gets back on the web-page, on which he left his request);

30) If client leaves a request on a web-page of a Company (Coalition) and gets his desired number of requests, he stopes to visit other web-pages;

31) After client stops to visit web-pages, he has to make a choice and pick one Contractor out his set of Potential Contractors;

32) Potential client behaviour description:

a. Each potential client gets his own subjective level of quality of each Potential Contractor $q_l(i) \geq 0$,

$$q_l(i) \in \begin{cases} [q_i - q_i * \alpha; q_i + q_i * \beta], \ (q_i - q_i * \alpha) > 0 \ , \\ [0; q_i + q_i * \beta], \ (q_i - q_i * \alpha) \leq 0 \ , \end{cases} \tag{5.2}$$

where α and β fall into a range from 0 to τ, where τ is a manually settable value. Here $\alpha \in [0; \tau]$, and $\beta \in [0; \tau]$, where α and β are randomly assigned on the basis of uniform distribution

b. Every client l has his quality perception level θ_l, which falls into the quality perception level range of the Market: $\theta_l = [\underline{\theta}; \bar{\theta}]$, where $\underline{\theta} = \underline{p}/\underline{q}$, and $\bar{\theta} = \bar{p}/\bar{s}$;

c. Every client tries to maximise his subjective utility that a potential client gets from a particular company for its price U_l

$$U_l(p_i, \theta_l, q_l(i)) = \begin{cases} \theta_l * q_l(i) - p_n, \ \theta_l * q_l(i) > p_i \ , \\ 0, \ \theta_l * q_l(i) \leq p_i \ . \end{cases} \tag{5.3}$$

As a result, if a potential client chooses between 5 organisations (potential contractors), he always gives his choice to the company that provides him with the maximum subjective utility;

33) To simulate different market environments and various individual strategies current model includes a set of manually settable scenarios:

a. There is a coalition on the market. Advertising budget of each organisation that entered a coalition can be higher than a coalitional entrance fee (companies invest into coalitional web-page and into their own web-sites),

$$AB_i \geq AS_1.$$

b. The observed company enters the coalition; however its advertising budget is equal to the entrance fee of the coalition.

$$AB_1 = AS_1 \quad ;$$

34) The quality level: of the observed company, which defines its personal quality move, is manually settable:

a. If the Observed Company gets manually set $q_1 = 2$, than the Observed Company has chosen “higher group move”;

b. If the Observed Company gets manually set $q_1 = 3$, than the Observed Company has chosen “peer group move”;

c. If the Observed Company gets manually set $q_1 = 4$, than the Observed Company has chosen “lower group move”;

35) To evaluate the effectiveness of different strategies there is a need for calculation of profit and ROAS of Company (Coalition);

a. ROAS of Company 1 is calculated in the following way: $ROAS_1 = I_1/AB_1$ where $ROAS_1$ – return on advertising spends of Company 1, $I_1 \geq 0$ – income of Company 1;

b. ROAS of the Coalition S_1 is calculated in the following way: $ROAS_{s_1} = I_{s_1}/X_{s_1}$ where $ROAS_{s_1}$- return on advertising spends of the Coalition, $I_{s_1} \geq 0$ – income of the Coalition;

c. Profit of a Company 1 is calculated in the following way: $V_1 = I_1 - AB_1$;

d. Profit of the Coalition S_1 is calculated in the following way: $V_{s_1} = I_{s_1} - AS_1$;

4.2 Parameters for the simulation

To run the simulation of the LGIPBC model, it was decided to use data from some particular market. Through this, results of the simulation could be closer to reality. Also that could ease the process of interpretation and analysis of results.

It was decided to use web-design market as a base for LGIPBC model basing on the following criteria:

1) Design of new web sites has an approximate 85% share in the structure of the income of an average Russian web-design studio. That could be a base for a statement that there is a market for the product (design of a new web-site), and web-design studios potentially have enough motivation to attract clients through advertising activities.

2) Respond to the question “From which sources you company gets new clients”, which provided respondents (CEOs of the companies) with multiple choice demonstrated the following tendencies:

- From 80 to 90% of all Russian web design studios get their clients through a personal recommendations
- More than 60% of new clients came with the web design studio link, disposed on its previous projects

- At least 30% of all new clients found these companies with a search engines (Google, yahoo and etc.)
- From 16% to 21% of new clients came from the PPC advertising (Yandex direct and Google Adwords)
- From 17% to 27% of new clients came from thematic portals and different platforms, that help companies to get clients (such as Avito.ru)

At the same time approximately 45% of all web design studios planned to spend the most part of their advertising budget on PPC advertising. Basing on this data there could be made a conclusion that PPC advertising (the only advertising activity used in model) is used by web-design market and characteristics this market could be used as a parameters for the simulation model.

To define the range of possible advertising budgets it was decided to apply one of approaches of advertising budget identification through a turnover of a company. According to one of these approaches, company should use some percentage from its turnover for some period of time, as an advertising budget for the next period of time. That means that to define potential borders of advertising range, it is needed to know average turnover of web-design studios and which average share of this turnover could be used by them as an advertising budget.

In 2011 Russian web design market faced a significant growth, with approximately 53% growth, comparing to the previous year and reached 14.9 billion rubbles volume. With the growth of the market, web design studios faced a significant increase in their turnover levels demonstrating 11.9 million rubbles average annual turnover in 2011 - 34% growth comparing with 2011 (see Fig. 4.1).

Distribution of total annual turnover among companies operating in different regions of Russian Federation looks in the following way:

- Central Federal District - 17 881 077 rubbles
- Northwestern Federal District - 12 645 474 rubbles
- Ural Federal District - 11 965 143 rubbles
- Siberian Federal District- 5 287 525 rubbles
- Volga Federal District - 4 540 238 rubbles

- Southern Federal District - 1 390 925 rubbles
- Far Eastern Federal District - 1 240 000 rubbles

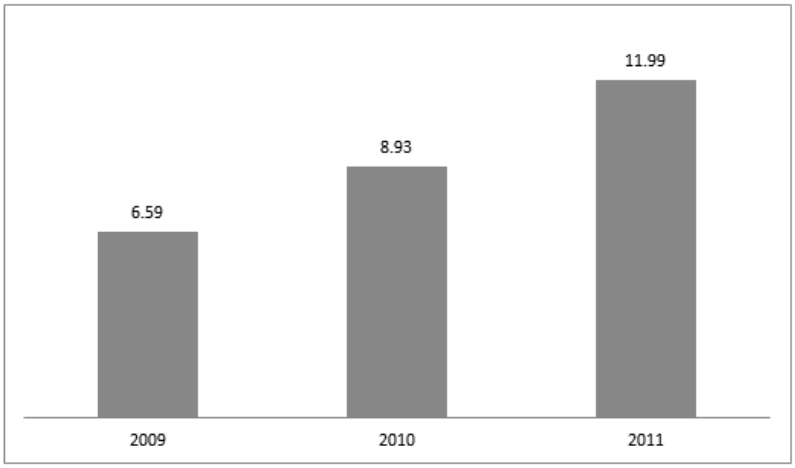


Figure 4.1 - Average annual turnover of Russian web design studio (million rubbles) (CMS magazine, 2012)

According to Chief Marketing Officer survey 2016, Average advertising budgets of companies that offer services in B2B sphere falls around 8,6% from the total revenue of a company. That brings us to the conclusion that average advertising budget of a web design studio is approximately 85,000 rubbles per month. It is decided to use this amount as an advertising budget of the observed company as the most expected one ($AB_1 = 85{,}000$). The top border of advertising budget range ($\overline{AB}$) is set on level of average monthly advertising budget of the Central Federal District – 128,000 rubbles.

Number of Companies *(n)* on the Market, there was made basing on the web-design market segmentation by the price criteria. In 2012 there was approximately 2,600 web design studios operation on the Russian market. Price diversification among Russian web design studios is pretty wide. Prices of organisations that operate in low-cost segment start with 5,000 rubbles and end up with companies that produce web-sites for prices that start from 2 million Rubbles. In the research that describes the web-design market, the most part of web design companies that operate on Russian market were distributed to 7 main price categories (price of an average web-site for an organisation):

1. Less than 50,000 rubbles (35.9%)
2. From 50,000 to 100,000 rubbles (31.5%)
3. From 100,000 to 200,000 rubbles (18%)

4. From 200,000 to 300,000 rubbles (8.8%)

5. From 300,000 to 500,000 rubbles (2.8%)

6. From 500,000 to 700,000 rubbles (1.6%)

7. Above 700,000 rubbles (1.6%)

Basing on the analysis it was decided to form groups basing of their pricing policy of organisations. It was decided to reduce the number of groups from 7 to 3 (see Table 4.1).

Table 4.1. Grouping of companies on a price basis

Price category	**Price range**	**Percentage of participants**	**Estimated number of participants**
1	Less than 50,000 rubbles	35.9%	933.4
2	From 50,000 to 200,000 rubbles	49.5%	1287
3	Above 200,000 rubbles	11.5%	379.6

One of the main motivations to unite all companies with prices above 200,000 in one group, was the assumption that clients, which can afford themselves a web-site for 500,000 rubbles, do not use PPC instruments to look for a contractor as often, as those, who look for a cheap or middle-priced products. That means that leaving categories with high prices as separate ones could make them unpopular among companies.

The second and third price categories were united in one common group, to make representatives of this group to be the most numerous group of companies, which could represent approximately half of the market.

In terms of current simulation it was decided to use second group as a total market (n = 1287), because it has a clear price borders that could be used as a price borders of the model: $\bar{p} = 50{,}000$, $\underline{p} = 200{,}000$

One of the forms of PPC advertising is a PPC advertising based on the platform of search engines. When people search some word or phrase using one of search engines, they get PPC advertisements in special fields of a page with a search results. According to the data collected by Yandex company (Russian search engine), which provides Russian business with

the PPC advertising services, in April 2016 PPC campaign built on one search phrase «Заказать сайт» (To order a web-site) would have the following terms and characteristics (on 30 days scale):

Average number of ad showings – 66,630

Click-through rate (CTR) – varies from 0,64% to 6,31% depending on the rate (average price of one click), that organisation chooses for its promotion (see Fig. 4.2).

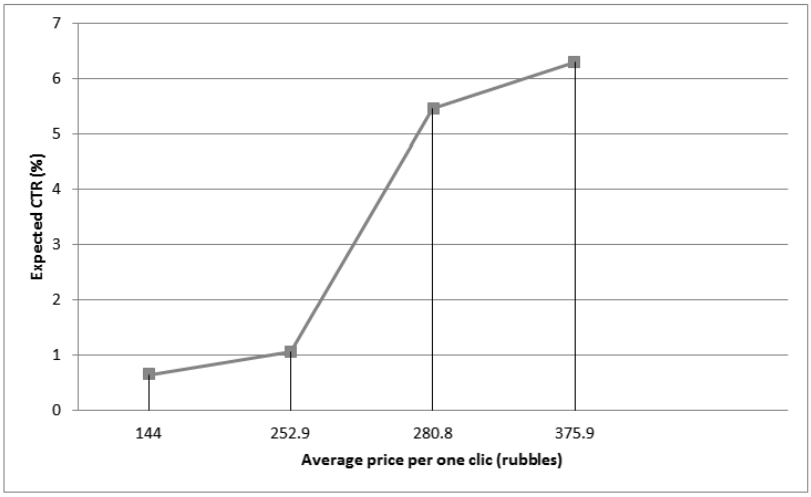


Figure 4.2 - CTR (%) dependence on the average price of one click (Yandex, April 2016)

Basing on this data, the maximum number of potential clients that visit a web-site of one particular studio can reach the number - 4205 visitors, that number is used to define the number of clients on the simulated Market (l = 4205). Estimated budget, needed to get such number of visitor is above 1 242 000 rubbles.

In terms of the current simulation average price per one click rates are used as PPCC rates (see Table 4.2):

Table 4.1 - PPC advertising instrument costs and CTR (Yandex ,April 2016)

PPC advertising instrument				
Price per one click (PPCC)	144	253	280	376
CTR	0.64%	1.05%	5.46%	6.31%

Finally it is important to estimate, how many visitors of web design studios web-sites convert to actual leads leaving their request for web-site development services. According to

“WordStream” company data (see Table 4.3) median conversion rate of the Internet resources is around 2.23% (B2B service), which means that approximately only 2 out of 100 visitors of a web-site of a web-studio convert into leads **(**Kim 2014**)**. That means that even if company pays minimum price per one click on its ad in PPC campaign (144 rubbles), one lead costs it approximately 7,200 rubbles.

Table 4.3 - Conversion rates of web-sites in different industries (Kim, 2014)

Distribution Point	All accounts	Ecommerce	Legal	B2B	Finance
Median CVR	2.35%	1.84%	2.07%	2.23%	5.01%
Top 25% CVR	5.31%	3.71%	4.12%	4.31%	11.19%
Top 10% CVR	11.45%	6.25%	6.46%	11.70%	24.48%

4.3 The simulation results and analysis

In terms of current research there were made more than 300 simulation rounds. Basing on the data, received from these simulation round there can be made some conclusions and suggestions. The values of all parameters of the simulation were taken from the analysis of the processes and trends that take place in the web-design industry (see Appendix 1).

To answer the second sub question of the current research (What is the possible impact of a lead generating coopetition on companies with different price and quality strategies?) author runs a series of tests with the observed company (see Appendix 2). The aim of these tests it to detect the best scenario (from the perspective of profit and effectiveness) for different combinations of price and quality of the services provided by the observed company. Criteria of effectiveness is evaluated through ROAS.

As a result, there were created profiles that demonstrate different levels of profit and ROAS at different scenarios (see Table 4.4). The main aim of these profiles is to help to define the best scenarios from perspectives of ROAS and profit.

Table 4.2 - RAOS and profit profile of observed company with high quality and low price

Price on services of the observed company:	Scenario	**1**	**2**	**3**	**4**	**5**	**6**
50,000	**ROAS**	1.412429	61.904	0.58851	9.18338	10.0047	28.5714
	Profit	35040	127900	-34960	695064	744040	579000
	The strategy(s) with the highest profit				2		
	The strategy(s) with the highest ROAS				2		
	The strategy(s) with the lowest profit				3		
	The strategy(s) with the lowest ROAS				3		

When profit of the observed company is used as an effectiveness criteria, outcomes of simulations demonstrate that in most cases companies benefit from Scenario 4 and Scenario 2 (see Fig. 4.3).

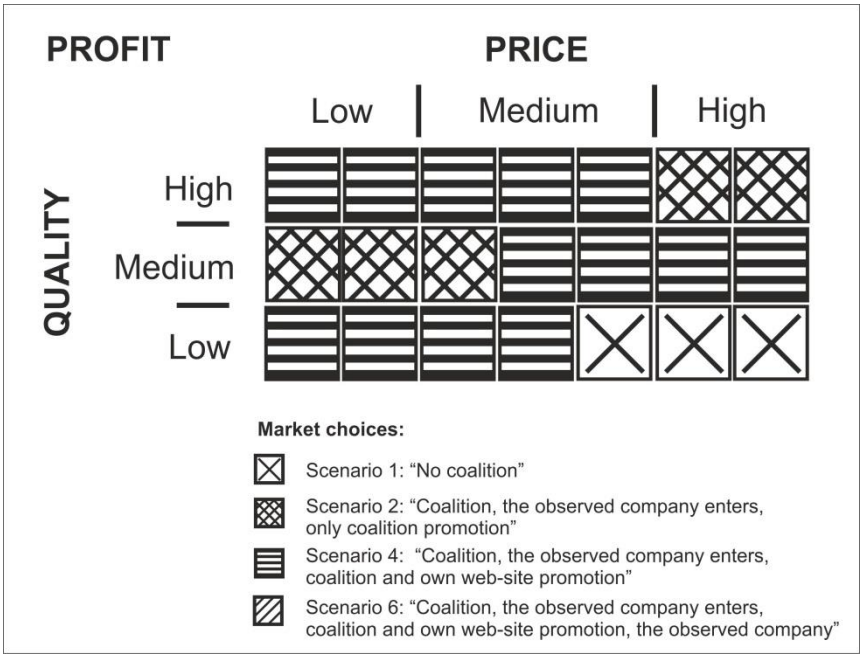


Figure 4.3 – Best individual scenarios from the perspective of profit,

The only category of companies that did not benefit from a coalition presence on the market is companies with low quality and high or upper-average prices. Basing on this data there could be made an assumption that presence of a LGIPBC has an impact on profits of

companies of a particular industry. In addition to that there is a base to suppose that this impact could be classified as positive.

In cases when ROAS is taken as main effectiveness criteria, simulation demonstrates pretty close results (see Fig. 4.4). The only significant difference is that there also appears Scenario 6 as a potential effective scenario for organisations that have low costs and high or low quality of services. ROAS perspective also demonstrates that companies with high or upper-average prices and low quality benefit from situations, when there is no LGIPBC on the market. All other participants get an increase of ROAS when LGIPBC is working and they take part in coopetition.

Although, in both effectiveness tests Scenario 2 seems to be not a realistic one, because it seems to be impossible, that all members of the Coalition refuse to invest their money into their own web-site. However simulation results demonstrate that organisations with high quality/high and upper-average price combination and Companies with medium quality/low and lower-average price get the best results from such scenario. That also could be used as a base for the assumption that LGIPBC increases the transparency on the market, making its clients to find Contractors, which suit their needs the most.

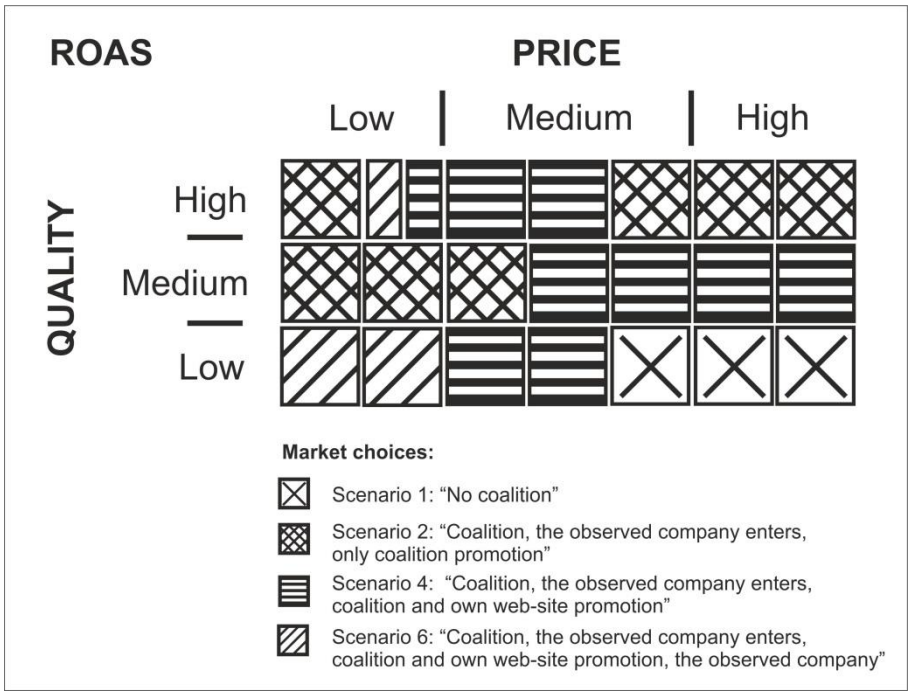


Figure 4.4 – Best individual scenarios from the perspective of ROAS

The third important assumption that can be made basing on the ROAS tests is the idea, that Scenario 6 of LGIPBC could be effective for companies with a low price policy. It means that companies with a low-price policy can afford themselves not to invest into their own

advertising campaigns, but use only the coalition, as the only source of leads, that they get. Basing on this assumption there could be also made an additional assumption, that there is a probability, that LGIPBC has a potential to decrease average prices in one particular industry.

According to the abovementioned tests results there is a sufficient basis to state that LGIPBC has a positive impact on industry, and can increase profits and effectiveness of advertising campaigns of its participants (except those who have high or upper-average prices and low quality).

The next set of simulation tests was made to answer the third sub-question (How number of the coopetition process participants influences on effectiveness of lead generating coopetition?). Using ROAS as criteria of effectiveness author gets outputs (see Appendix 3), which could be used a base for the conclusion that answers the third sub-question of current research: Number of members of the coalition has an impact on the ROAS of the coalition (see Fig. 4.5).

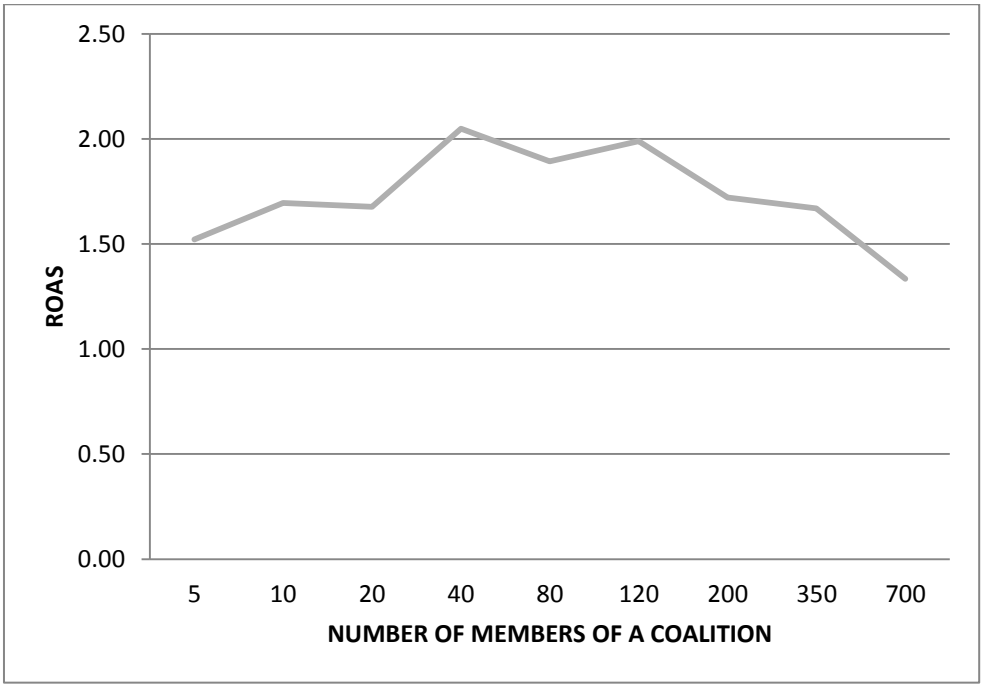


Figure 4.5 – Dependence of ROAS of the coalition on the number of members of the coalition.

There could be observed a clear increase of ROAS until the number of members of a coalition reaches some particular level. After this level there is another clear trend that demonstrates the decrease of ROAS of the coalition.

One of the possible reasons for such trend could be that average income of coalition starts to decrease, when the number of participants grows. Growth of the number of participants could cause the transparency increase and decrease of the prices as a result. In other words client see, who has the same quality but lower price, and buy from them.

The second test submits the assumption, that LGIPBC has a potential for the increase a transparency of a particular market, however, from the standpoint of author, this assumption should be checked in a more precise way.

Finally there were made tests that aimed to define if c appearance on the market and growth of number of its members can potentially increase average utility of one client on the market (see Appendix 4). As a result there was detected a following tendency (see Fig. 4.6):

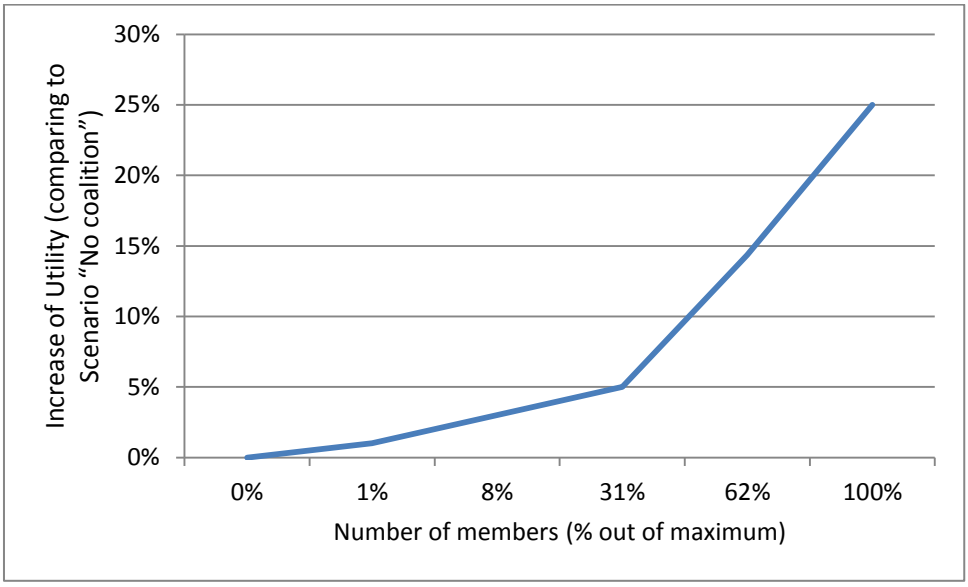


Figure 4.6 - Dependence of average utility of a client from number of members

Basing on the results of utility tests we can assume that increase of the number of members of a coalition that bases on the LGIPBC (and its existence) have a potential to increase average utility on the market. As a result, level of satisfaction of an average client can increase significantly.

That phenomenon detected in terms of simulation can be explained with an assumption that increase of number of member of a coalition gives a client a chance to compare more offers at once and define the best one (from subjective position of a client)

This potential benefit that market can get from LGIPBC applying also could be used as a ground for the assumption that LGIPBC can become a source of market transparency

significant growth, which means an increase of competition among companies and all outcomes that derive from that.

4.4 Summary of Chapter 4

1) Author described an agent-based model using concept of LGIPBC as a basis. To model competition, author describes the rules, how clients make their choice, basing on their subjective perception of quality.

2) Main parameters and border values of the agent-based model described in the first section of current paragraph are taken from the set of marketing researches, which try to describe Russian web-design industry.

3) The main conclusions made on the base of simulation results. All companies of industry (except those, which have high price and low quality) get additional profits and ROAS from LGIPBC applied to their industry. There is a trend that demonstrates that ROAS of a coalition organised on the base of LGIPBC grows until some particular number of members of the coalition is reached. Then ROAS of this coalition starts to decrease (when number of members gets bigger). That means that potentially for each coalition there could be defined an optimal number of members. Finally average level of utility, that clients get from their choice of contractor grows (in terms of an industry), when LGIPBC is implemented on this industry.

4) Basing on the main results of current research, there also can be made an assumption, that LGIPBC potentially can increase transparency of some particular industry. However, this hypothesis should be checked more precisely.

5. CONCLUSIONS

5.1. Discussion of the findings

The main goal of current research: To define potential impact that can be caused by a lead generating internet platform-based coopetition among companies, which operate in one industry, on this industry.

To do that author had to reach following objectives:

Objective 1: Creation and description of a design of a lead generating internet platform-based coopetition.

In terms of current research there was an attempt to create a design of a LGIPBC among companies that distribute the same product or service on the same market. The concept of LGIPBC design and mechanics is described in Chapter 3 of current master thesis. It describes a co-invested way of lead generating among companies that voluntarily join a coalition of companies, which produce the same product close in its characteristics. Coalition forming and lead generating processes are coordinated by a two-sided internet based platform. First group of users of this two-sided internet based platform is represented by distributors of a particular product and the second group is represented by their potential clients. Each lead generated by coalition with its co-invested lead generating campaign is available to each member this coalition. As members of the coalition get lead, they start competing for the chance to convert this lead to an actual client. LGIPBC can be classified as a coopetition because it compliance with two its basic signs (Walley, 2007):

1) Companies cooperate to make the pie bigger
2) After companies managed to make the pie bigger, they start competing for it.

That means that the first objective of the current research can be considered as achieved.

Second, third, and fourth objectives of current research were achieved through the simulation of the agent-base model. This model tries to describe the market of one product with a chance of a coopetitional coalition formation. It is described in the first section of Chapter 4. To define parameters, which could describe the environment and agents of this model, there was used a data from the Russian web-design market, as it was considered as suitable for LGIPBC. Description of parameters is provided in the second section of Chapter 4. Main results of simulation tests are provided in Appendixes 2-4.

Objective 2: Detection of a potential impacts of the suggested lead generating internet platform-based coopetition on individual participants of market with different price/quality strategies.

The agent-based simulation of an industry of one product with inputs taken from the Russian web-design industry demonstrates that the nearly all participants of industry can gain additional profits and increase their ROAS with the help LGIPBC. The only category of companies that does not win from LGIPBC appearance on the market are companies with inflated prices and low quality. This set of conclusions could be considered as a base for the presumption that the second sub-aim of current research was achieved by the author (Chapter 4, section 3).

Objective 3: Identification of a possible impact of number of the lead generating internet platform-based coopetition members on the effectiveness of the lead generating internet platform-based coopetition.

There was detected a tendency, that ROAS of organisations that participate in LGIPBC depends on the number of participants. Marginal ROAS stays positive until the number of members of a coalition reaches some critical point, after which there is a clear decrease of ROAS could be observed. Potential reason for such tendency could be a decrease of average income of each member in the coalition, with an increase of the number of its members. That gives the author a right to suggest that the last sub-aim was also achieved. There could be made a conclusion, that number of members of coalition gathered on the base of LGIPBC causes some influence on effectiveness of money spent on advertising by its members. Also that could be a sign of potential increase of market transparency in cases when market starts to apply LGIPBC. Each new member increases the transparency on the industry. So as a result clients manage to find the same quality for lower price (Chapter 4, section 3).

Objective 4: Definition of effects that number of the lead generating internet platform-based coopetition participants can cause on an average utility of clients of industry, which applies lead generating internet platform-based coopetition.

Finally there were made tests that aimed to define, if industry that applies LGIPBC increases average (and total as a result) utility of clients of this industry. Results collected from the simulation of the model can be used as a ground for an assumption, that: The more companies of a particular industry enter coalitional relationships on the base of LGIPBC, the higher average utility clients of this industry get. That could be explained by the assumption

that LGIPBC provides clients with a chance to compare different offers from many potential contractors. As a result clients have access to more options and they can choose a better offer. These results also can be used as a base for the assumption that LGIPBC can increase transparency of some industries (Chapter 4, section 3).

5.2 Practical implications

In the field of managerial and practical use of the current research there is a clear possibility and interest to imply the LGIPBC on the base of some real multisided lead generating platform to test potential of the designed concept in the real life conditions. However, it is important to understand that in terms of master thesis work this instrument can be described as a static one (everybody make their choice at the same moment). Also it is important to understand, current research does not deal with LGIPBC from the perspective of one single repetition (potential effects of reputation or strategy modification through time are not examined in terms of this research).

LGIPBC can be used as an instrument that helps market to displace companies with high prices and low quality of distributed product out of the market. That makes it to be a good chance for industries to increase the common level of satisfaction of clients and make market conditions to be more transparent.

Also LGIPBC could be applied as a chance for companies which have low prices and low quality (start-ups) to get their first clients with a reduced sum of money invested into their advertising campaigns.

Finally LGIPBC has a potential to provide organisations with additional money (released from the advertising budgets), which could be used on the improvement of quality of the service or good that they distribute, or to invest these money into R&D. As a result that makes LGIPBC to be a possible way of growth and improvement of industry that manages to apply it.

5.3 Limitations

The first limitation of current master thesis is connected with peculiarities of LGIPBC. It still needs to be modified, to become more realistic. For example now LGIPBC suggests that all companies that want to join a coalition make their decision at once. Even though it is possible, from the standpoint of author, that ability to join a coalition at any moment of time could change the whole mechanism dramatically.

All other limitations of results achieved in terms of current study derive from the limitations of the model that was used to examine potential of LGIPBC. It is not clear how Operator could predict results of advertising campaigns, if they stand on the base of more than one advertising instrument, and what potential result could be got, if market uses all instruments and Operator stays only with the PPC instrument.

Also current research does not pay any attention to the potential reputational effects, which could also cause some effect on average price of one lead for one particular member of the coalition, ROAS and profits which LGIPBC can generate That is because now each new simulation session suggests, that there was no Coalition before, and there will be no coalitions in the future.

Due to the fact that in terms of model author uses only one grouping characteristic (price) it is not clear, how situation could change, if there would be used a set of characteristics, as a base for group formation.

Finally, current version of the model simulates only market with only one coalition on it. If model could be able to simulate the process of coalitional partition among two or three coalitions at once and then there would be a simulation of more than one coalition operating on the market, potentially results could differ from current ones significantly.

5.4 Theoretical implications and further research

From the perspective of theoretical contributions, current master thesis explore coopetition not from the descriptive point of view, as the most part of modern researches (e.g. Luo 2004; Basole, Park and Barnett, 2015), but from the position of potential practical implementation of coopetition as a tool. Current research tries to create an applicable framework or a tool, that could be applied to industry through a two-sided internet based platforms. If academic society admits that LGIPBC could be considered as a coopetitional strategy, than this concept could become a base for the new branch of theoretic researches and tests (simulation and real ones).

At the same time current research provides some additional data to the question of how coopetition influences on competition, which only starts to be discussed in current academic literature (e.g. Oxley et al., 2009). It demonstrates a potential to help markets, to increase their transparency and push organisations with low quality and high prices out of market. Also there are results that show, how average price of a product decrease, when

coopetition involves more participants. That could be a sigh of potential increase of competition on the market if it applies LGIPBC.

Also current research suggests that competition could be considered as a potential solution of pay-off distribution in cooperation games (or at as one more distribution concept). Today there are many concepts of fair distribution of a coalitional pay-off, however each of these concepts stands on the assumption that some particular principle, that lies in its basement is fair (Chakravarty, Mitra and Sarkar, 2015). LGIPBC using a coopetitional principles demonstrates how coalition can exist without any pay-off distribution problems, because each participant of the coalition gets all leads, and then all members of the coalition compete for these leads. The only question that remains to be opened is: How LGIPBC could work with other coalitional partition principles (if it could).

However, one of the main theoretical contributions of the current research is a list of questions and further theoretical researches that should be examined in future. One of these is the data that shows how companies with low quality and high prices benefit only from scenarios, when there is no coopetition in the industry. That could be a base for the hypothesis, that coopetition could be used as a tool that could increase a transparency of a particular industry or the whole economy in common.

LGIPBC could potentially be used as a base for creation of a Coopetitional Game (Game theory). As a game It has several steps: coalitional partition, and then competition for clients. That means that this game could be a static one, with an incomplete information. Pay-off of such game would be non-transferable (Gibbons, 1992). There also could be made experiments to define if such coopetitive game could be checked on superadditivity and monotonicity characteristics

Also there is still actual a question of limitations for coopetition. Can all companies of industry enter a coopetition without decrease of average profit? Can coopetition be a tool that could define the optimal number of participants on the market?

There is also should be answered a question: Which industries can apply LGIPBC and which cannot? That is because it is not clear, what characteristics particular industry should have, so that LGIPBC could be affective for its participants.

Current research deals with the principles of choice (how clients make their choice between potential contractors). Using the same simulating model, with some modifications there is an opportunity to evaluate how total and average Utility of clients change if there is a

lead generating coopetition inter-firm relationship on the market. There is a possibility that total utility grows, when companies get into coopetition relationships.

In terms of the lead generating platform-based coopetition concept there should be made more empirical tests (probably on the base of the real platform). These tests could have a significant impact on development of industries and possibly change the principles of inter-firm relationships in future. Fit is not clear which particular industries can apply LGPC as a tool. Because of the peculiarities and special conditions, this could be considered as serious barriers LGPC use.

Finally there still remains unanswered a question: “Which instruments and services internet platform could be provide to its second group of users (clients of product distributes), so that the first group would be able to increase its profits and effectiveness of advertising budget?”

REFERENCES

Amstrong, M. 2006. Competition in two-sided markets. *Rand J Econ* 37(3): 668–691

Banks, J. 2000. *Getting started with Automod. Vol. II.* Chelmsford Massachusetts: Brooks Automation, Inc 2004.

Basole, R. C., H. Park, and B. C. Barnett. 2015. Coopetition and convergence in the ICT ecosystem. *Telecommunications Policy,* 39: 537–552

Bengtsson, M., and S. Kock. 1999. Cooperation and competition in relationships between competitors in business networks. *The Journal of Business and Industrial Marketing,* 14(3): 178-191.

Bengtsson, M., and S. Kock. 2000. "Coopetition" in business networks—To cooperate and compete simultaneously*. Industrial Marketing Management,* 29(5): 411−426.

Binmore, K. 2007. *Game theory.* New York: Oxford University Press.

Bouncken, R. B., J. Gast, S. Kraus, and M. Bogers, 2015. *Coopetition: a systematic review, synthesis, and future research directions*. Springer-Verlag Berlin Heidelberg

Brandenburger, A. M., and B. J. Nalebuff. 1996. *Co-opetition*. New York: Doubleday Currency.

Burgers, W.P., C.W.L. Hill, and W.C. Kim. 1993. A Theory of Global Strategic Alliances: The Case of the Global Auto Industry Author*. Strategic Management Journal,* 14 (6): 419-432.

Caillaud, B., and B. Jullien. 2003. Chicken and egg: competition among intermediation service providers. *Rand J. Econ.* 34 (2): 309–328.

Chakravarty, S., M. Mitra, and P. Sarkar. 2015. *A course on cooperative game theory*. Delhi: Cambridge Univ. Press.

Cherrington, P. 1976. *Advertising as a business force: a compilation of experiences (Reissue edition)*. Manchester, NH: Ayer Co Pub.

CMS magazine. 2012. Russian web-design market analytics: trends and expectations of 2012. [online document]. [Accessed 2012]. Available at: http://research.cmsmagazine.ru/webanalytics2011/

Czernek, K., and W. Czakon. 2016. *Trust-building processes in tourist coopetition: The case of a Polishregion. Tourism Management,* 52: 380-394

Davis, M.D. 1997. *Game theory - A nontechnical introduction.* Dover Publications: Mineola, N.Y.

Faulkner, D.O. 2000. Opposing or complementary functions? In *Cooperative strategy. Economic, business and organizational issues*, by D. Faulkner, and M. De Rond, 341-361: Oxford University Press.

Fish, T. 2009. *My digital footprint.* London: Futuretext.

Gambarelli, G. and G. Owen. 2004. *Essays in cooperative games*. Boston, Mass. [u.a.]: Kluwer Acad. Publ.

Garrette, B., X. Castaner, and P. Dussauge. 2009. Horizontal alliances as an alternative to autonomous production: product expansion mode choice in the worldwide aircraft industry 1945-2000. *Strategic Management Journal,* (30): 885–894.

Gibbons, R. 1992. *A primer in game theory*. New York [u.a.]: Prentice-Hall Financial Times.

Gnyawali, D.R. 2006. Impact of Co-Opetition on Firm Competitive Behavior*:* An Empirical Eximination. *Journal of Management*, 32, 507-530.

Harsanyi, J.C. and R. Selten. 1988. *A general theory of equilibrium selection in game.* MIT Press: Cambridge, Mass.

Hidding, G. J., J. Williams and J. J. Sviokla. 2011. How platform leaders win. *Journal of business strategy.* 32 (2): 29-37,

Jennings, N. R. 2001*. An agent-based approach for building complex software systems. Communications of the Arch,* 44(4): 35-41.

Kalai, A., and E. Kalai. 2012. Cooperation in Strategic Games Revisited*. The Quarterly Journal of Economics,* 128 (2): 917-966

Kelly, A. 2003. *Decision making using game theory - An introduction for managers*. Cambridge University Press: Cambridge, UK.

Lado, A.A., N.G. Boyd, and S.C. Hanlon. 1997. Competition, Cooperation, and the Search for Economic Rents: A Syncretic Model. *The Academy of Management Review,* 22 (1): 110-141

Kim L.. 2014. Everything You Know About Conversion Rate Optimization Is Wrong. [online document]. [Accessed March 2014]. Available at: http://www.wordstream.com/blog/ws/2014/03/17/what-is-a-good-conversion-rate

Lavie, D. 2006. The competitive advantage of interconnected firms: an extension of the resource-based view. *Academy of Management Review*, 31: 638–658.

Law, M. A., D. Kelton, and W. David. 2000. *Simulation modeling and analysis*. New York [u.a.]: McGraw Hill

Leemis L., and S. K. Park. 2012. *Discrete-Event Simulation: A First Course.* Upper Saddle River, N.J.: Pearson Prentice Hall.

Lewicki, R. J., and B. Bunker. 1996. Developing and maintaining trust in work relationships. In *Trust in organizations: Frontiers of theory and research.* by R. M. Kramer, and T. R. Tyler, 114 - 139. Thousand Oaks, California: Sage.

Liu, R. 2013. Cooperation, competition and coopetition in innovation communities. *Prometheus,* 31(2): 91–105

Luo, Y. 2004. *Coopetition in international business.* Copenhagen Business School Press.

Luo, Y. 2007. A coopetition perspective of global competition. *Journal of World Business,* 42: 129–144.

Macy, M.W. and R. Willer. 2002. From Factors to Actors: Computational Sociology and Agent-Based Modeling. *Annual Review of Sociology*, 28: 143-166.

Mahadevan, B. 2000. Business models for Internet-based e-commerce: An anatomy. *California Management Review*. 42(4): 55–69.

Mariani, M. 2007. *Coopetition as an emergent strategy: empirical evidence from an Italian consortium of opera houses.* Int Stud Manag Org 37(2):97–126

Morris, M. H., Koçak, A., and Özer, A. 2007, *Coopetition as a small business strategy: implications for performance.* J Small Bus Strategy, 18(1):35–55

Muzellec, L., S. Ronteau, and M. Lambkin. 2015. Two-sided Internet platforms: A business model lifecycle perspective. *Industrial Marketing Management* 43: 236–249

Nash, J. 1950. Equilibrium points in n-Person Games, *Proceedings of the National Academy of Sciences of the United States of America*, 36(1)1: 48-49..

Osborne, M. J. 1994. *A course in game theory*, MIT Press: Cambridge (MA)

Osterwalder, A., Y. Pigneur, and A. Smith. 2010. *Business model generation*. Hoboken, NJ: Wiley and Sons.

Oxley, J.E., R.C. Sampson, and Silverman, B.S. 2009. Arms Race or Détente? How Interfirm Alliance Announcements Change the Stock Market Valuation of Rivals. *Management Science*, 55 (8): 1321–1337.

Parrachino, I., S. Zara, and F. Patrone. 2006. Cooperative Game Theory and its Application to Natural, Environmental, and Water Resource Issues: 1. Basic Theory, *World Bank Policy Research Working Paper Series,* vol. November, 2006, no.WPS4072.

Peleg, B. and P. Sudhölter. 2003*. Introduction to the theory of cooperative games*, Kluwer Academic: Boston, Mass.

Ritala, P., A. Golnam, and A.Wegmann. 2014. Coopetition-based business models: The case of Amazon.com*. Industrial Marketing Management,* 43: 236–249

Ritala, P., and P. Hurmelinna-Laukkanen. 2009. What's in it for me? Creating and appropriating value in innovation-related coopetition. *Technovation,* 29: 819–828.

Rochet, J.C., and J. Tirole. 2003. Platform competition in two-sided markets. *J. Eur. Econ. Assoc.* 1: 990–1029.

Rothaermel, F.T., 2001. Incumbent's advantage through exploiting complementary assets via interfirm cooperation. *Strategic Management Journal,* 22: 687-699.

Rusko, R. 2011. Exploring the concept of coopetition: A typology for the strategic moves of the Finnish forest industry. *Industrial Marketing Management,* 40: 311–320

Sharma, A. and J. Sheth. 2004. Web-based marketing. *Journal of Business Research*, 57(7): 696-702.

Sundararajan, A. (n.d.). Network Effects, Nonlinear Pricing and Entry Deterrence. *SSRN Electronic Journal.* Available at SSRN: http://ssrn.com/abstract=382962 or http://dx.doi.org/10.2139/ssrn.382962

The CMO Survey. 2016. CMO Survey Report: Highlights and insights. [online document]. [Accessed February 2016]. Available at: https://cmosurvey.org/wp-content/uploads/sites/11/2016/02/The_CMO_Survey-Highlights_and_Insights-Feb-2016.pdf

Tong, T.W., and J.J. Reuer. 2010. Competitive consequences of interfirm collaboration: How joint ventures shape industry profitability. *Journal of International Business Studies,* 41, 1056– 1073.

Von Neumann, J. and O. Morgenstern. 1944. *Theory of Games and Economic Behavior*. Princeton: Princeton University Press

Walley, K. 2007. Coopetition. An introduction to the subject and an agenda for research. *International Studies and Management and Organization,* 37(2): 11−31.

Wooldridge, M. and N.R. Jennings. 1995. Intelligent agents: theory and practice. *The Knowledge Engineering Review.* 10(2): 115-152.

Yandex Direct Budget Forecast. April 2016. Available at: https://direct.yandex.ru

Zhang, J., and G. Frazier. 2011. Strategic alliance via co-opetition: supply chain partnership with a competitor. *Decis Support Syst,* 51(4):853–863

Zhu, F., and M. Iansiti. 2012. Entry into platform-based markets. *Strategic Management Journal Strat. Mgmt. J.,* 33: 88–106

APPENDIX 1. BASE PARAMETERS FOR ALL SIMULATION ROUNDS

Number of companies that operate on particular market (N)	1287
Number of potential clients (NL)	4205

Prices range	Minimum	Maximum
	50,000	200,000

Quality level (QL)	2	3	4
Middle price of a quality level (MPQL)	100,000	116,500	133,000
Left price limit (LPL) %	50%		
Right price limit (LPL) %	50%		

CVR of the observed company	2.23
CVR of the coalition	2.23
Cost of one click chosen by the coaliiton	144
Cost of one click chosen by the observed company	144
Coalitional entrance fee	21000
Advertising budget of the observed company	85000

Conversion of a web-site (from visitor to lead) CVR	Minimum	Average	Maximum
	0	2.23	5

PPC advertising instrument				
Price per one click (PPCC)	144	253	280	376
CTR	0.64%	1.05%	5.46%	6.31%

Number of requests that a client makes (NO)	Minimum	Maximum
	1	15

APPENDIX 2. ROAS AND PROFIT TESTS (OBSERVED COMPANY TESTS)

Quality level of an observed company - HIGH

Price on services of the observed company:	Scenario	**1**	**2**	**3**	**4**	**5**	**6**
50,000	**ROAS**	1.412429	61.90476	0.588512	9.183385	10.00471	28.57143
	Profit	35040	1279000	-34960	695064	744040	579000
	The strategy(s) with the highest profit	2					
	The strategy(s) with the highest ROAS	2					
	The strategy(s) with the lowest profit	3					
	The strategy(s) with the lowest ROAS	3					
60,000	**ROAS**	2.118644	40	2.824859	9.183385	2.824859	34.28571
	Profit	95040	819000	155040	695064	155040	699000
	The strategy(s) with the highest profit	2					
	The strategy(s) with the highest ROAS	2					
	The strategy(s) with the lowest profit	1					
	The strategy(s) with the lowest ROAS	1					
75,000	**ROAS**	1.765537	75	0.882768	5.298107	2.648305	42.85714
	Profit	65040	1554000	-9760	365040	140040	879000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	2					
	The strategy(s) with the lowest profit	3					
	The strategy(s) with the lowest ROAS	3					
100,000	**ROAS**	3.531073	28.57143	1.177024	10.59621	2.354049	19.04762
	Profit	215040	579000	15040	815040	115040	379000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	2					
	The strategy(s) with the lowest profit	3					
	The strategy(s) with the lowest ROAS	3					

Pice on servicies of the observed company:	Scenario	**1**	**2**	**3**	**4**	**5**	**6**
125,000	**ROAS**	2.942561	5.952381	1.471281	4.415089	1.471281	5.952381
	Profit	165040	104000	40040	290040	40040	104000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	2 and 6					
	The strategy(s) with the lowest profit	3 and 5					
	The strategy(s) with the lowest ROAS	3 and 5					
140,000	**ROAS**	1.647834	0	0	8.241499	6.591337	0
	Profit	65040	0	0	615040	475040	-21000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	4					
	The strategy(s) with the lowest profit	2 and 3					
	The strategy(s) with the lowest ROAS	2 and 3					
150,000	**ROAS**	1.765537	0	0	35.71429	7.062147	0
	Profit	65040	-84960	-84960	729000	515040	-21000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	4					
	The strategy(s) with the lowest profit	2 and 3					
	The strategy(s) with the lowest ROAS	2, 3 and 6					

Quality level of an observed company – MEDIUM

Price on services of the observed company:	Scenario	**1**	**2**	**3**	**4**	**5**	**6**
50,000	**ROAS**	1.176471	30.95238	1.176471	3.529412	1.764706	19.04762
	Profit	15040	629000	15040	215000	65000	379000
	The strategy(s) with the highest profit	2					
	The strategy(s) with the highest ROAS	2					
	The strategy(s) with the lowest profit	1 and 3					
	The strategy(s) with the lowest ROAS	1 and 3					
60,000	**ROAS**	1.412429	31.42857	1.412429	5.651314	2.118644	28.57143
	Profit	35040	639000	35040	395064	95040	579000
	The strategy(s) with the highest profit	2					
	The strategy(s) with the highest ROAS	2					
	The strategy(s) with the lowest profit	1 and 3					
	The strategy(s) with the lowest ROAS	1 and 3					
75,000	**ROAS**	1.765537	32.14286	0	5.298107	0	21.42857
	Profit	65040	654000	-84960	365064	-84960	429000
	The strategy(s) with the highest profit	2					
	The strategy(s) with the highest ROAS	2					
	The strategy(s) with the lowest profit	3 and 5					
	The strategy(s) with the lowest ROAS	2 and 3					
100,000	**ROAS**	3.531073	4.761905	4.708098	23.80952	4.708098	4.761905
	Profit	215040	79000	315040	479000	315040	79000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	4					
	The strategy(s) with the lowest profit	2 and 6					
	The strategy(s) with the lowest ROAS	1					

Price on services of the observed company:	Scenario	**1**	**2**	**3**	**4**	**5**	**6**
125,000	**ROAS**	0	0	2.942561	5.886785	4.413842	0
	Profit	-84960	-21000	165040	415064	290040	-21000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	4					
	The strategy(s) with the lowest profit	2 and 6					
	The strategy(s) with the lowest ROAS	1, 2 and 6					
140,000	**ROAS**	1.647834	0	0	3.2966	1.647834	0
	Profit	55040	-21000	-84960	195064	55040	-21000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	4					
	The strategy(s) with the lowest profit	3					
	The strategy(s) with the lowest ROAS	2, 3 and 6					
150,000	**ROAS**	0	0	0	3.532071	1.765537	0
	Profit	-84960	-21000	-84960	215064	65040	-21000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	4					
	The strategy(s) with the lowest profit	1 and 3					
	The strategy(s) with the lowest ROAS	1, 2, 3 and 6					

Quality level of an observed company – LOW

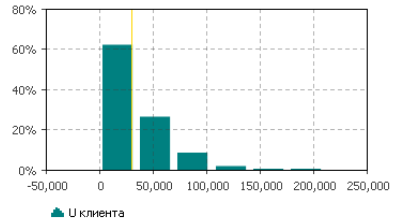
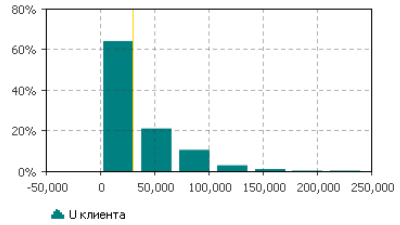
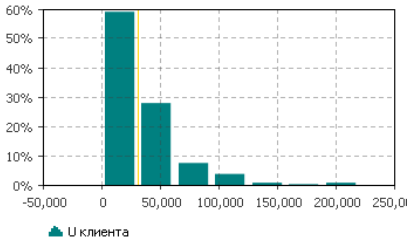
Price on services of the observed company:	Scenario	**1**	**2**	**3**	**4**	**5**	**6**
50,000	**ROAS**	0.588235	2.380952	0.588235	3.529412	2.352941	11.90476
	Profit	-35000	29000	-35000	215000	115000	229000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	6					
	The strategy(s) with the lowest profit	1 and 3					
	The strategy(s) with the lowest ROAS	1 and 3					
60,000	**ROAS**	0.706215	2.857143	0.706215	4.238485	2.824859	5.714286
	Profit	-24960	39000	-24960	275064	155040	99000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	6					
	The strategy(s) with the lowest profit	1 and 3					
	The strategy(s) with the lowest ROAS	1 and 3					
75,000	**ROAS**	0.882768	0	0	3.532071	2.648305	0
	Profit	-9960	-21000	-84960	215064	140040	-21000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	4					
	The strategy(s) with the lowest profit	3					
	The strategy(s) with the lowest ROAS	2, 3, and 6					
100,000	**ROAS**	1.177024	0	0	2.354714	1.177024	0
	Profit	15040	-21000	-84960	115064	15040	-21000
	The strategy(s) with the highest profit	4					
	The strategy(s) with the highest ROAS	4					
	The strategy(s) with the lowest profit	3					
	The strategy(s) with the lowest ROAS	2, 3, and 6					

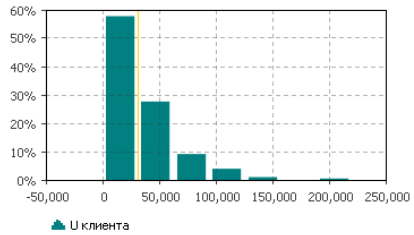
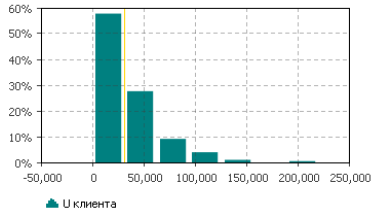
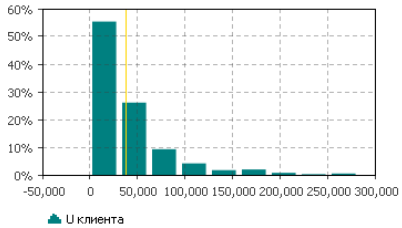
Price on services of the observed company:	Scenario	**1**	**2**	**3**	**4**	**5**	**6**
125,000	**ROAS**	1.471281	0	0	0	0	0
	Profit	40040	-21000	-84960	-84936	-84960	-21000
	The strategy(s) with the highest profit	1					
	The strategy(s) with the highest ROAS	1					
	The strategy(s) with the lowest profit	3, 4 and 5					
	The strategy(s) with the lowest ROAS	2, 3, 4, 5 and 6					
140,000	**ROAS**	3.295669	0	0	0	0	0
	Profit	195040	-21000	-84960	-84936	-84960	-21000
	The strategy(s) with the highest profit	1					
	The strategy(s) with the highest ROAS	1					
	The strategy(s) with the lowest profit	3, 4 and 5					
	The strategy(s) with the lowest ROAS	2, 3, 4, 5 and 6					
150,000	**ROAS**	3.531073	0	0	0	0	0
	Profit	215040	-21000	-84960	-84936	-84960	-21000
	The strategy(s) with the highest profit	1					
	The strategy(s) with the highest ROAS	1					
	The strategy(s) with the lowest profit	3, 4 and 5					
	The strategy(s) with the lowest ROAS	2, 3, 4, 5 and 6					

APPENDIX 3. IDENTIFICATION OF A LINK BETWEEN ROAS OF A COALITION AND NUMBER OF MEMBERS OF THIS COALITION

Entrance fee	ROAS of a coalition at particular number of members of a coalition								
	5 members	**10 members**	**20 members**	**40 members**	**80 members**	**120 members**	**200 members**	**700 members**	**1287 members**
21,000 rubbles	1.43	1.71	1.38	2.43	2.34	2.21	1.89	1.89	1.66
42,000 rubbles	1.61	1.68	1.97	1.66	1.44	1.77	1.55	1.44	1.01
Average	**1.52**	**1.70**	**1.68**	**2.05**	**1.89**	**1.99**	**1.72**	**1.67**	**1.33**

APPENDIX 4. UTILITY TESTS

Utility distribution	Number of members of coalition	Average Utility of a client	Number of members (% out of maximum)	Increase of Utility *(comparing to Scenario "No coalition")*
	0	30,208	0%	-
	10	30,637	1%	1%
	100	31,115	8%	3%

Utility distribution	Number of members of coalition	Average Utility of a client	Number of members (% out of maximum)	Increase of Utility *(comparing to Scenario "No coalition")*
	400	31,715	31%	5%
	800	34,546	62%	14%
	1287 (maximum)	37,746	100%	25%

APPENDIX 5. WEB-DESIGN STUDIO QUESTIONNAIRE

1. What is your forecast of changes in the average cost of developing websites?
2. In which sectors you expect the greatest rise in demand for web services?
3. Which channels of promotion you want to send the bulk of the company's marketing budget (2012)?
4. From what sources most often clients learn about your company's?
5. What services does your company have brought the greatest profit in the past year?
6. For which services you expect the greatest growth in demand in 2012?
7. What level of salary your Sales Manager gets?
8. What level of salary your Project Manager gets?
9. What level of salary your Director of Marketing and PR gets?
10. What level of salary your Manager Marketing and PR gets?
11. What level of salary your Technical Director gets?
12. What level of salary your Programmer gets?
13. What level of salary your Art Director gets?
14. What level of salary your Designer gets?
15. What level of salary your Technical Designer gets?
16. What level of salary your HTML-coder gets?
17. What level of salary your SEO-specialist gets?
18. What level of salary your Content Manager gets?
19. Due to some experts you plan to expand the state in 2012?
20. What is the turnover of your company in 2011?

APPENDIX 6. FUNCTION THAT DEFINES A CHOICE OF A CLIENT

```
int i=0;
Company result = requested_companies.get(i);
double best_cust_opinion = get_Main().get_opinion_quality(result.quality);
double poleznost_best =  quality*best_cust_opinion-result.price;
double poleznost=0;
double poleznost_output=0;
double cust_opinion=0;
for(Company cur:requested_companies){
	cust_opinion=get_Main().get_opinion_quality(cur.quality);
	poleznost=quality*cust_opinion-cur.price;
	if(cur.price==0){
		System.out.println("Current price: "+cur.price+" index: "+cur.comp_index);
		getEngine().pause();
	}
	if(poleznost>poleznost_best){
		//новая компания
```

```
                poleznost_best=poleznost;
            }else if(poleznost==poleznost_best andand uniform()>0.5){
                //новая компания
                poleznost_best=poleznost;
                result=cur;
                best_cust_opinion=cust_opinion;
            }
}
selected_comapny=result;
//company id
if(get_Main().coop_companies.contains(selected_comapny)){
get_Main().excelFile.setCellValue(selected_comapny.comp_index, 1, get_Main().row, 1);
get_Main().excelFile.setCellValue(selected_comapny.quality, 1, get_Main().row, 2);
get_Main().excelFile.setCellValue(best_cust_opinion, 1, get_Main().row, 3);
get_Main().excelFile.setCellValue(selected_comapny.price, 1, get_Main().row, 4);
get_Main().excelFile.setCellValue(selected_comapny.profit, 1, get_Main().row, 5);
get_Main().excelFile.setCellValue(quality, 1, get_Main().row, 6);
```

```
poleznost_output=max(0,poleznost_best);
get_Main().excelFile.setCellValue(poleznost_output, 1, get_Main().row, 7);
get_Main().client_poleznost.add(poleznost_output);
get_Main().row++;
}
selected_comapny.n_orders++;
                    result=cur;
                    best_cust_opinion=cust_opinion
```