

# **RESEARCH ARTICLE**

### GAME THEORY IN STARTUP STRATEGY: INSIGHTS INTO FINANCIAL AGREEMENTS, COMPETITIVE MARKETS, AND MARKET ENTRY TIMING

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Manuscript Info	Abstract
<i>Manuscript History</i> Received: 25 July 2024 Final Accepted: 27 August 2024 Published: September 2024	This research delves into the application of game theory in enhancing decision making within businesses by structuring data into a payoff matrix, for evaluating the relative benefits of cooperation and competition, among enterprises. The study illustrates that game theory contributes to shaping decisions and impacts the planning for a company's expansion. Business owners who understand game theory acquire perspectives on when to collaborate and compete in ventures. This insight is very useful, for firms that aim to thrive in the startup ecosystem. The paper will focus on the primary decisions such as the agreement with the venture capitalist making decisions in competitive markets and determining the optimal market entry timing.

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### **Introduction:-**

In the field of game theory there is a structure employed to assess the results of decision making scenarios. Within game theory's domain are games involving two players striving to maximise their respective benefits through strategies and foresight. It's important to note that game theory isn't, about defeating an opponent or selecting the choice for a decision maker, in a scenario. Instead it functions as a tool to weigh options and their potential outcomes.

The main goal of game theory is to forecast the reasons, behind people's decisions and anticipate their reactions based on those choices. This method is used to analyse interactions by predicting theactions that individuals may take when they observe the behaviour of others.

Collaborative Game Theory focusses on groups of players uniting to tackle challenges and achieve goals together rather than engaging in competition within the parties by establishing a common objective to achieve success for the entire team. The dynamics within a group are crucial in this approach. The central emphasis is on competition and strategic interactions within the group. The outcome of this game theory centres around one player emerging as the winner while others incur the losses, which contrasts with game theory scenarios where multiple players join forces to tackle obstacles and accomplish goals. Collaborative game theory involves individuals, with aligned interests joining forces to tackle challenges and achieve shared objectives. This approach underscores the importance of putting the goals and interests of the group above one's own aspirations and ambitions. A business leader utilises game theory principles to make decisions and strategies by taking into account factors like predicting competitors actions and planning responses.Game theory offers a structure, for evaluating the method to accomplish the intended outcomes.

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### Methodology:-

This study provides an analysis using information gathered from secondary sources such, as websites and publications, like newspapers and journal articles. Drawing from existing literature available publicly the study seeks to showcase the uses of game theory within the startup environment.

### Agreement between entrepreneur and venture capitalist

Venture capital is investors that help startups by providing funding in exchange for equity in the company. By providing initial funding for start-ups along with guidance, venture investors help entrepreneurs scale their operations. An investor agreement is a document that outlines the primary terms, and conditions between an entrepreneur and venture capitalist. This agreement is a formal contract that ensures both parties are clear about the expectations from each other, making it essential to prevent future disputes. This document provides the framework for future decision-making and plays a key role in the success of the operation. An understanding of these models can assist in the preparation of a contract that is mutually beneficial to the startup and venture capitalist. Our research assumes that investors seek to maximise the expected return on their investments, and that entrepreneurs seek to maximise the probability of survival of the company.

There is a principal-agent problem when a disagreement arises due to a difference in the priorities between the owner of the startup and the agent to whom control of the startup has been delegated. The venture capitalist provides funds to the entrepreneur believing that he will invest them to grow the company. However, the entrepreneur may have different incentives. This can lead to moral hazard.

Thus, the entrepreneur can signal the quality of the startup by investing their own capital into the company or by attracting a respected co-investor. A venture capitalist screens startups through duediligence, term sheets, and staged venture capital investments to minimise the problem of asymmetric information. Venture capitalists and entrepreneurs will agree to certain commitments such as follow-on investments, or not diluting the ownership position. However other times they will issue credible threats such as pulling back funding, to increase the likelihood of agreed-upon terms being adhered to.

This negotiation over equity might be modelled as a bargaining game, where the entrepreneur and startup founder would have to agree on some kind of split reflecting their relative contribution, risk, and future expectations. The entrepreneur values retaining control, while the venture capitalist values a return proportionate to the risk taken. The bargaining outcome depends on the respective powers of the parties such as alternative sources of finance available to the entrepreneur and the reputation of the venture capitalist. The higher the outside option of the entrepreneur, the better the equity share that they will get.

Specifying the person who has control of major decisions, such as hiring and firing executives, approving budgets, and planning the strategic direction of the business. Control rights are an example of a sequential game. The control rights in a company are usually decided depending on the stage of the company. In the early stages there may be more control with the venture capitalist, in later stages, the entrepreneur might regain some control.

Key issues here could be about the number of board seats each person has and voting rights. An entrepreneur would want control over the running of the business's day-to-day activities, while the venture capitalist may want to hold the majority of the power over important decisions.

While determining the sequence and size of distributions when there is a liquidity event, such as an exit through sale or IPO, liquidity agreements should account for asymmetrical risk by ensuring that the venture capitalist has their investment returned before common shareholders receive any distribution. A 1x liquidation preference is standard, wherein venture capitalists get back precisely their investment before others are paid. Of course, higher preferences are possible such as 2x or more in cases where the startup is particularly risky. At the same time, too high a liquidation preference can demotivate the entrepreneur, as his upside is drastically reduced.

Ensure the entrepreneur stays in the company for his or her equity. Another way to look at vesting schedules is as a mechanism to decrease moral hazard which can be done by aligning the entrepreneur's incentives with the long-term success of the startup. The incentive compatibility mechanism works such that an entrepreneur earns his or her equity over time. Typical vesting schedules involve a 4-year period with a 1-year cliff, which provides that if he leaves in a year, theentrepreneur will earn absolutely nothing and then earn a portion of his equity monthly or annually thereafter.

What this does is discourage early departure and ensure that the entrepreneur is motivated enough to stay on until the company reaches some critical growth stage of its life cycle.

Performance-based release of funds is when the money is to be released upon completion of certain performance milestones. This is a dynamic game wherein the further investment by the venture capitalist depends on the entrepreneur's meeting his pre-specified goals. This will minimise the risk for the venture capitalist and also ensure that the entrepreneur stays on course to attain these goals. Secondly, the selection of milestones is very important because the milestones to be chosen have to be achievable and in line with the growth trajectory of the company. However, too-aggressive milestones may result in early funding cutoffs, while too-lenient ones may not provide enough performance incentives.

A section on information rights can be added to confirm that regular updates and access to the company's financial information are provided to the venture capitalist. Game theory can be applied to this issue of information rights through the lenses of signalling and monitoring. The venture capitalist needs to monitor the performance of the company to decide on further investment. On the other hand, the entrepreneur has to signal his or her competence along with that of the firm. This isgenerally agreed to by entrepreneurs looking to establish trust and reduce perceived risk with the venture capitalist in hopes of getting better terms on other areas within the contract.

### Game theory in competitive markets

The Nash equilibrium is a concept where no player can benefit by changing their strategy. For the startups, this would be to find a price that will make them competitive in the market without provoking a price war or eroding profitability. It is vital to consider what the possible responses of existing competitors would be. A price that is too low can cause a price war, whereas one that is too high might discourage potential customers. Reaching a Nash equilibrium is where the startup willreach a position it can maintain in the market.

The Bertrand and Cournot models are alternative ways in which competition can be conceptualized. In the case of the Bertrand model, firms compete by setting prices and often cut prices aggressively. In the case of the Cournot model, competition is quantity-based, in which market prices are set by supply. For example, a startup plans to enter the electric vehicle market. From a Bertrand perspective, it would invest its efforts in setting a competitive price as a way of immediately gaining customers. From a Cournot strategy, though, it would focus on producing a certain number of vehicles and let market demand set the price.

Choosing between the two models depends primarily on the industry and market dynamics of the startup. In a very competitive market where similar products exist, the Bertrand competition will force prices down. However, if the market faces constraints in terms of production capacity, a more applicable model will be the Cournot model, since control over supply gives the startup pricing power.

Price discrimination is a situation in which firms charge different prices to different customers, based on their willingness to pay. To startups, this is a very powerful tool for maximising revenues generated by capturing consumer surpluses under diverse sets of customers. Price discrimination is thus able to target various customer segments effectively in any startup application. It might involve an early adopter discount, premium pricing for advanced features, and dynamic pricing based on user behaviour and demand.

In the Stackelberg model, one firm leads by setting its strategy before the others, called followers, do. Knowing this, the leader can look ahead to the reactions of the followers and find the optimal strategy. A new entrant in the market for wearable technology devices could develop some type of innovative product and simply declare its price before the competition is prepared to introduce its offering. A first-movers might even be able to establish industry standards and influence pricing decisions made by competitors who enter later. Start-ups can utilise first-mover advantage to create innovative products and establish price strategies with which the competition will need to respond. Understanding how one's competitors will respond, the start-up may be able to hold a first-mover advantage over time and perhaps own the market segment.

Dynamic pricing is the process of changing prices over time as a response to changes in the market. Game theory helps startups understand competitors' strategic moves and hence allows them to optimise their pricing strategies. Dynamic pricing is highly applicable to startups in industries where demand and competition face constant changes.

Using game theory, startups will be able to build algorithms where, based on demands, prices would automatically update to ensure competitiveness while maximising profits.

Behavioural economics deals with the effect of psychological factors on consumer behaviour, hence on pricing decisions. A startup also employs techniques from behavioural economics in building up a pricing strategy that appeals to customers' emotions and cognitive biases. Using anchoring, a startup would show the higher price for a product first, then the discounted price. It will make the discount more attractive and create a sense of urgency in the consumer thus such a technique can incentivise consumers to purchase the products. Knowing how customers think about prices helps firms create pricing strategies that work with human psychology such as the use of charm pricing (\$1.99 as opposed to \$2).

### Market entry timing

Analysing customer sentiment towards competitors is very important for startups to get an idea of the brand loyalty of customers, which might influence market entry timing and strategy. Game theory can be used to predict how competitors might react to a new firm and product using customer sentiment. A startup, upon detecting negative sentiment toward a particular competitor, might anticipate that the competitor will either lower prices or increase marketing efforts to retain customers. This is where the startup may decide whether to enter aggressively in such markets or wait for the right time to do so.

Timing for strategists involves the match of market entry with the firm's long-term focus and the life cycle of its industry. A firm might ride the wave upward during the growth phase or might make more effort towards differentiation during maturity. The use of game theory enables the forecasting of competitors' moves at different phases of the industry cycle. For example, in the growth stage, competitors may exhibit reduced aggressiveness as they concentrate on market expansion, whereas in the maturity stage, their efforts might shift towards safeguarding their market share.

Comprehending these dynamics can assist a startup in strategically timing its market entry to either evade direct competition or take advantage of a phase characterised by diminished competitive pressure.

Financial analysts can evaluate entry timing by considering the cost of investment against return estimates. Market entry at times of low investment cost, for example during the recession, pays off if there is an expectation of market recovery. Game theory can help in modelling various market scenarios, and anticipating competitor behaviour at times of downturns. A startup would expect, upon entering a market during a downturn, competitors either to cut costs which reduces the level of competition or to double down on investments to retain market share. The startup will use such an analysis to make informed decisions on the manner of entry which can be either aggressive or cautious.

Marketers may perceive timing as a strategic advantage to enhance their competitiveness. Introducing a product immediately before the peak season has the potential to secure market share ahead of competitors' responses. Game theory can also be applied in modelling the timing of market entry, using competitor reactions. For instance, if a startup is about to introduce its product ahead of peak season, it can already foresee the probability that competitors will either cut prices in advance or introduce competing products.

Market entry timing can be evaluated based on when the indicators that show the demand for the product. For example, the growing health awareness has provided a prosperous entry point for plant-based meat alternatives. It can help in trying to forecast how competitors may react to emerging consumer trends. If a startup identifies a growing trend, it might predict whether competitors will immediately enter the market or wait. Having this information allows the start-upto time entry so as to either capture the trend early or avoid a crowded market.

Sometimes, changes in the regulations of a country create an opportunity for market entry. Companies that can quickly adapt to new regulations can exploit these changes before their competitors do. Game theory provides a very clear framework for modelling competitor responses to potential regulatory measures. When some kind of regulatory adjustment is anticipated, a startup firm can use game theory to determine whether other firms will actively lobby against the rule changes, quickly adopt new standards, or delay their compliance-related actions. In turn, this focus allows the firm to position itself as a first mover in compliance or innovation.

Comprehending the requirements of the intended audience is crucial. For instance, an organisation intending to launch a novel fitness application should assess whether there is an emerging trend favouring health and wellness within the target demographic. Game theory will help the upcoming organisations predict the behaviour of competitors regarding changes in consumer demand. When a new trend in fitness comes up, a startup can use game theory to determine whether competitors would directly move to meet that demand or stick with current product offerings. The same knowledge helps to devise an entry strategy that takes maximum advantage of existing market voids in order to avoid head-on competition.

Economic indicators offer critical information regarding the financial well-being of the market. A boom in the economy distinguished by elevated consumer spending may signal favourable conditions for market entry. In contrast, during periods of recession, consumers are likely to reduce expenditures on non-essential items. Game theory can be used as a model to predict how competitors can respond to different economic circumstances. For instance, if there is a recession, it is expected that competitors will cut prices or lessen marketing expenses. This can be used by a startup to make decisions on market entry with a lower-cost product or wait until favourable economic circumstances.

The products should abide by the cultural norms of the respective country. With the use of game theory, a foreign entrant should be able to anticipate how local competitors may respond. Using game theory, for instance, a startup could determine if local firms would stress cultural differences or if they would aim to mimic the strategy of the new entrant. It thus addresses the approach towardbranding and adapting products.

Building mechanisms for customer feedback is considered a way to enhance product-market fit. Feedback loops have been effectively utilised by companies during their early market entry, such asDropbox and Airbnb. Game theory can be used to predict how competitors can react to different consumer feedback of a firm. For instance, if consumers give positive feedback on a product feature, the competition may aim to replicate it. Knowing this, a startup would have to strive to innovate faster.

Launching a product in a controlled, small-scale environment can provide a lot of insight. A competitor might rush to market with their product if they see the pilot as a threat. In turn, the startup can then anticipate such reactions and scale up rapidly or wait it out, refining the productfurther before a full-scale launch.

Hem with user input before a full-scale launch. The competitor might rush to market with their version of the product if they see the pilot as a threat. In turn, the startup can then anticipate such reactions and scale up rapidly or wait it out, refining the product further before a full-scale launch.

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