Game Theory in the Realm of Pop Culture: A Novel Approach to Social Media Strategy

Mirko Talajić
University of Algebra, Zagreb

Ilko Vrankić
University of Zagreb, Faculty of Economics and Business

Lucia Matić
University of Algebra, Zagreb

Abstract

This paper explores the intersection of game theory and pop culture as a potent strategy for amplifying social media engagement. A methodological analysis demonstrates how game theory principles can be effectively applied to social media campaigns by leveraging the universal appeal of pop culture. The study introduces a simple yet illustrative model that outlines the strategic use of pop culture elements to attract new followers and maximise net profit, considering variables such as potential follower base, cost of pop culture integration, and the preferences of different audience segments towards pop culture-infused products. Findings underscore the untapped potential of conscious game theory application in social media strategy design, offering a fresh perspective on achieving optimal engagement through a balance of appeal to pop culture enthusiasts and those favouring traditional content. This contribution is novel in its approach. It provides a comprehensive review of game theory's utility in pop culture and presents a detailed framework for its application in social media campaigns. By bridging theoretical concepts with practical application, this research opens new avenues for strategic engagement in the digital age, making a significant addition to both academic research and practical marketing strategies.

Introduction

In today's digital world, social media platforms have become vital for connecting with others and engaging an audience on social media is crucial for the success of a brand or a campaign. One promising strategy to improve engagement is to use pop culture references when creating a new brand strategy. These references can help brands connect with their target audience, make their content more relatable, and create a laid-back atmosphere in which the audience will feel comfortable with commenting, sharing and liking.

Humans play games whenever they interact with the goal of winning it. Game theory is a field of study that analyses strategic interactions among rational decision-makers and has emerged as a powerful and interdisciplinary tool in understanding human behaviour and decision-making progress (Osborne & Rubinstein, 1990).

However, for a game to make sense, both players must play them rationally and, according to the great philosopher David Hume, regard reason as the 'slave of the passions', making any consistent behaviour count as rational (Binmore, 2007). Nevertheless, how do we determine the winner or the loser in a game? John Nash, a brilliant mathematician and Nobel laureate, left a great mark on game theory with the introduction of Nash Equilibrium – a basic building block of game theory (Binmore, 2007). His ground-breaking work focused on finding solutions to cooperative games where players could communicate and form agreements. Nash Equilibrium is a fundamental concept representing a stable state in a game where no player has an incentive to change their strategy; in other words, it is a set of strategies where no player can improve their outcome by changing their actions. His work helped researchers better understand how players behave in competitive situations and how individual decisions influence outcomes.

The study of game theory dates to ancient civilisations, and its evolution through the centuries has provided valuable insights into understanding the dynamics of games, conflicts, and negotiations (Osborne & Rubinstein, 1990).

This paper aims to explore the link between using pop culture phenomena and references and improving engagement on social media. It will also provide a step-by-step guide on how brands can enhance their social media engagement through creative brand campaigns. By exploring game theory concepts, understanding social media dynamics, and examining the power of creative brand campaigns, this thesis aims to empower brands to effectively use pop culture as a strong asset, foster meaningful connections and drive impactful engagement in the digital world.

One of the goals of this paper is to explore the role of game theory in its application in pop culture and the unconscious application of the theory in this area. This goal is complemented by the need to raise awareness of this unconsciousness so that, through conscious application and the use of game theory tools, management in the integration of pop culture into product development and user engagement can be enriched. The aim is to demonstrate

how the simple use of game theory tools can elevate management and development to a higher level in all areas, not just the area presented in this paper.

A special contribution of this paper is the comprehensive overview of the application of game theory in pop culture, which follows the description of the basic types of games. Numerous instances demonstrate the utilisation of game theory within popular culture, where often, the individuals employing these theoretical principles may not even recognise their application as a game theory ingredient.

This paper emphasises the advantage of intentional application for enhancing outcomes by leveraging the proposed methods of game theory. This not only alerts strategy designers to their participation in a game-theoretical framework but also encourages them to use game theory's tools for making decisions.

Despite its simplicity, the presented model effectively showcases the theory's potential, aligning with this research's objective. The paper's unique contributions include a structured approach detailing the implementation process of a game theory-based social media campaign at every step within the proposed framework.

Methods and tools

This research employs a multidisciplinary approach, integrating game theory principles with pop culture analysis to explore the implicit and explicit influences of strategic interactions on consumer behaviour and media engagement. The methodology outlines the theoretical game theory frameworks to investigate these dynamics.

The paper utilises Nash Equilibrium, a foundational theory developed by John Nash, to explore stable states in systems where participants interact. Nash Equilibrium is defined as a condition in which no participant can gain by unilaterally changing their strategy, provided the strategies of others remain unchanged.

Game theory games serve as powerful tools to study decision-making, cooperation, and conflict in various fields. They also offer valuable insights into strategic interactions and have practical applications in understanding real-world scenarios. The main principles of game theory will be shown with examples of a couple of well-known special games: Prisoner's Dilemma, Battle of the Sexes, Chicken Game, and *Ultimatum Game*.

The simplest and maybe most important game in game theory is often considered to be the *Prisoner's Dilemma*. In this game, two players have two choices: to cooperate or to betray. The game's payoffs are as follows: if both players cooperate, they both receive a moderate reward (R); if one player cooperates while the other betrays, the betrayer receives a high reward (T), and the co-operator receives the lowest reward (S); If both players betray, they both receive a moderate punishment (P).

The matrix for this type of game looks like in Figure 1.

Figure 1: Prisoner's Dilemma matrix

	Player 2	
	Cooperate	**Betray**
Cooperate	(R, R)	(S, T)
Betray	(T, S)	(P̲, P̲)

Player 1 (row labels: Cooperate, Betray)

Source: Authors' work

When players make a choice, they have to strategize and consider the best option for them in a particular situation. In game theory, a dominant strategy refers to a strategic option that provides the best possible outcome for a player, regardless of the choice made by other players. This powerful concept helps players identify the most advantageous move in each situation (Tadelis, 2013).

In this depicted game, using the "best response" method to find equilibrium, both players have a dominant strategy, which means that regardless of what the other player chooses, they are better off betraying. However, the collective outcome would be more beneficial if both players chose to cooperate. The *Prisoner's Dilemma* is a simple yet insightful game in game theory, mostly used to study cooperation and conflict in various real-life situations.

The second most known game in game theory is *Battle of the Sexes*. The stereotype in this game predates the female liberation movement (Binmore, 2007). In this game, two players have to decide between two activities they wish to do together. Each player prefers one activity over the other, but they both prefer being together rather than being apart. The game payoffs are as follows: Players 1 and 2 can choose between Activity A and Activity B; Players prefer to do Activity A if the other player also chooses Activity A; Player prefer to do Activity B if the other player also chooses Activity B The matrix for this type of game looks is in Figure 2.

Figure 2: Battle of the Sexes matrix

	Player 2	
	Activity A	**Activity B**
Activity A	(4̲, 3̲)	(1, 1)
Activity B	(0, 0)	(3̲, 4̲)

Player 1 (row labels: Activity A, Activity B)

Source: Authors' work

In this type of game, the payoffs are subjective, but they typically represent the level of satisfaction each player receives from the outcome. This type of game may not have a unique Nash Equilibrium. (Tadelis, 2013) This game has two pure equilibriums, as depicted in Figure 2.

If both players drive towards each other and neither swerve, they will face the worst possible outcome—-10 (a catastrophe). However, if one player yields by swerving and the other does not, the player who did not yield is the winner. This scenario also represents an equilibrium. If both players yield, there effectively is no winner. The matrix for this type of game looks like Figure 3.

Figure 3: Chicken game matrix

		Player 2	
		Drive	**Backdown**
	Drive	(-10, -10)	(1, -1)
Player 1			
	Backdown	(-1, 1)	(0, 0)

Source: Authors' work

Ultimatum Game is a classic two-player game that explores fairness and strategic decision-making. In the *Ultimatum Game,* one player (proposer) is given a sum of money and must propose how to divide it between themselves and the other player (responder). However, the other player can accept or reject the proposed division. The game payoffs are as follows. If the responder accepts Offer 1, both players receive the proposed amounts (1, 2); If the responder rejects Offer 1, both players receive (1, 2); If the responder accepts Offer 2, both players receive the proposed amounts (2, 1); If the responder rejects Offer 2, both players receive nothing (0, 0). The matrix for this type of game looks like in Figure 4, with Nash equilibriums marked.

Figure 4: Ultimatum matrix

		Player 2 Responder	
		Accept	**Reject**
	Offer 1	(1, 2)	(1, 2)
Player 1 Proposer			
	Offer 2	(2, 1)	(0, 0)

Source: Authors' work

This game is a great example of the idea of utility that economists have invented to better describe the motivation of the players to play the game than simply saying that they like

winning and dislike losing. The idea of utility allows players to assign a numerical value to each possible outcome of a game. (Binmore, 2007)

In a well-known experiment conducted by economists Werner Güth, Rolf Schmittberger, and Bernd Schwarze (1982), participants frequently rejected offers that they considered unfair, even if it meant they would not receive any amount of money. Participants seemed to place significant importance on the perceived fairness of the offer. The results of such an experiment could theoretically be explained using game theory if the players' perceptions of fairness in the offers were included in their payoffs. This approach would consider how players evaluate the fairness of outcomes, potentially influencing their decisions in the game.

Game theory will be used as the methodology and tool. The research method will review the application of game theory in pop culture and analyse previous research in this area.

An Overview of Game Theory Applications in Popular Culture and Social Media

Brands recognise the potential of social media and are adjusting their tone of voice and communication strategies, with social media channels being the number one point of contact with their consumers. They are starting to become the providers of the content rather than just passive watchers (Qualman, 2012).

It can be seen several pop-culture moments with game theory applications. In Arthur Conan Doyle's world, iconic detective Sherlock Holmes and his nemesis Professor Moriarty are engaged in intellectual and strategic battles that resemble the game of *Prisoner's Dilemma*. In the last story, *The Final Problem* (Doyle, 1893), Holmes and Moriarty approach their final confrontation. In it, they both find themselves involved in a high-stakes game in which the outcome of their decisions determines their fates. Similarly to the *Prisoner's Dilemma* depicted before, Holmes and Moriarty are presented with a choice: Holmes must decide whether to capture Moriarty and bring him to justice. At the same time, Moriarty has to decide whether to confront Holmes and risk capture or avoid the confrontation altogether.

If they both cooperate and avoid confrontation, they will move on with their lives without any harm. On the other hand, if one chooses to betray the other, it may result in a decisive advantage, but it also carries the risk of serious consequences for both parties. The outcome of their strategic decisions at the Reichenbach Falls determines their fate in either way.

In the movie *La La Land* from *2016,* directed by Damien Chazelle, viewers can follow the *Battle of the Sexes* game between two aspiring artists as they cross paths. The movie explores the balance between their wishes and their desires for a meaningful romantic relationship. Both main characters, Mia and Sebastian, are very passionate about their careers, which leads them in different directions and consequently creates tension in their relationship. Throughout the film, they face various challenges and dilemmas, and they have to decide between their professional ambitions and their love for each other.

Chicken Game is a clear example of how pop culture influenced game theory. The movie *Rebel Without a Cause* from 1955, directed by Nicholas Ray and starring James Dean, inspired the

name for this game as it was invented to commemorate a scene in which Dean and another boy drive cars towards a cliff edge to see who will chicken out first (Binmore, 2007).

One of the best examples of Chicken Game can be seen in *The Dark Knight* from 2008, directed by Christopher Nolan, in a scene where Joker decides to conduct a social experiment on two ferries, one carrying innocent civilians and the other one carrying prisoners. Joker plants explosives on both ferries and provides each ferry with a detonator for the other boat's explosives; he then tells the passengers that if one ferry does not blow up the other one within a set time, he will detonate both. In this game, both ferries have to decide whether to blow up the other one to save themselves or risk being blown up. This kind of game depicts philosophical questions about human behaviour, ethics, and the unpredictable nature of humanity.

Ultimatum Game also found its way into pop-culture representation. One of the best examples is from a popular mockumentary-style comedy TV show, The Office, in Season 5, Episode 23 of Michael Scott Paper Company from 2009, directed by Gene Stupnitsky and Lee Eisenberg. In this episode, the main character, Michael Scott, leaves his job at Dunder Mifflin, a paper company he works in, to start his own paper company, with some of his co-workers joining him. They soon became a significant competitor to Dunder Mifflin, and to solve this issue, CFO David Wallace must negotiate with Scott. Wallace has the power to set the terms of the deal; on the other side, Scott must decide whether to accept or reject the offer.

One of the biggest TV shows, Squid Game from 2021, directed by Hwang Dong-hyuk, is a true example of how a TV show, which is now a very big part of pop culture, can show the basic principles of this economic discipline. The most-watched Netflix TV show of all time, *Squid Game* prominently features elements of game theory through its plot and characters. The show revolves around a group of financially struggling individuals who participate in a deadly competition for a chance to win an enormous cash prize. They are forced to play various games in different scenarios, which can be analysed using game theory concepts. In the first episode of the show, viewers can see the principles of a game called *Prisoner's Dilemma*. On pages three and four of this paper, there is a detailed description and a matrix for playing this type of game. In that episode, players participate in a game called 'Red Light, Green Light' where they must advance towards the goal during the 'green light' phase and freeze during the 'red light' phase. The true conflict of *a Prisoner's Dilemma is when players have to decide if they want to cooperate and follow the rules* or if they would try to advance during the 'red light' phase. As the show progresses, players try to form alliances to strategies on how to survive and win the final prize. These alliances are characterised by playing and seeking a Nash Equilibrium; for a detailed explanation of this concept, please refer to page three of this thesis. The players need to make a choice that optimises their outcome while considering the choices other players make. In the end, players' decisions are influenced by Nash Equilibrium as they navigate the game's challenge.

Exploring academic literature, according to the available sources, no article has been found that deals with this phenomenon. The result of this analysis and research opens up a new field of research. If game theory were consciously incorporated into the whole process,

would the movie scenarios perhaps be different or maybe have different endings? Would the use of theoretical foundations of game theory make it possible to create better scenarios? All these questions open a wide spectrum of future theoretical research and practical application of game theory.

Related to social media, some theories and articles try to incorporate game theory into the concept. Wu, Yuan, Qi, and Dong (2021) in their paper investigate the public opinion dissemination process on social networks under incomplete information. For the study, an evolutionary game theory model is established. The findings indicate that the rate at which opinions converge plays a crucial role in the spread of public opinion. This convergence is directly linked to the effectiveness of the dissemination node's role in promoting public opinion. It is inversely related to the inhibitory impact of the immune node on the spread of public opinion.

Wan et al. (2023) delve into two critical factors shaping the diffusion process, focusing on how information is shared among individuals and across the broader landscape of online social networks. A sophisticated model for the diffusion of both positive and negative information is crafted, drawing upon the principles of evolutionary game theory to encapsulate this intricate dynamic. To mitigate the detrimental effects of negative information on the network's ecosystem and enhance the spread of positive information, mechanisms for real-time intervention are implemented alongside the formulation of an optimal strategy for the allocation of control resources. The research contributes to the field of network management by offering a theoretical framework aimed at comprehensively understanding and effectively managing the flow of a wide array of information types.

Wang et al. (2022) focus on a framework that includes two producers and an online merchant to evaluate the impact of investing in advertising through recommendation systems, both with and without the integration of cost-sharing mechanisms. They utilise game theory models and quantitative analyses across three different scenarios, provide strategic advice for online retailers to maximise benefits and prevent the exploitation by "free riders." For the entire supply chain, advertising proves to be more effective than recommendation systems when their effectiveness coefficients are low. However, when these coefficients are higher, employing recommendation systems emerges as the superior strategy for the entire supply chain.

Wu et al. (2016) utilise game theory to explore the wearable device market's dynamics, considering factors such as consumer variety, consumer population density, and companies' strategies for investing in Big Data Analytics (BDA). Their research demonstrates a direct relationship between BDA investment and increased profit. Using this research, it is possible to improve social media content and strategy to have more engaged customers.

Du (2023) introduces a concept where the embedded cross-network effect can assist cross-border e-commerce (CBEC) platforms in establishing fairer and more effective partnerships with sellers, leveraging the inherent network structural features of the platforms. Utilising a two-stage evolutionary game model, the research verifies the factors influencing these dynamics. By integrating mathematical derivations from evolutionary game theory with

simulation techniques, the study scrutinises the cross-network effect's contribution to cooperative engagements. It suggests an evolutionary game model influenced by the cross-network effect to better align with cooperation strategy analysis within a dual-market framework. This model accounts for the dynamic interplay between the cross-network effect and its influencing factors. The cross-network effect plays a role in adjusting the revenue share rate for small and medium-sized enterprises (SMEs). By elevating their infrastructure quality, CBEC platforms can strengthen the bonds between consumers and their sites, offering a more cost-effective and efficient method to attract sellers.

Game theory approach as an extended tool on pop culture usage in social media – simple model example

The game theory concept can serve as a bridge between social media and the engagement between brands and users. Through this concept, brands will be able to effectively leverage pop culture references in their social media strategies, which can result in an increase in engagement, deeper connections between users and the brand, and a captivating digital presence.

Sources of pop culture are numerous, as already mentioned in this paper. However, it is interesting to note how popular culture can be a product of advertising itself, and proof of this is in the brands that have become household names, such as Gillette, Tesla, or Rolex. The campaign that incorporates elements of pop culture needs to be sensible, timed just right, and interesting, and it needs to stand out from all the other brands and messages that reference the same pop-cultural event (Fraculj & Lekaj, 2021).

Some people may be very selective in their consumption of pop culture, but it is difficult, and almost impossible, to find someone who has not been touched by pop culture at all. People can sort the world into regions based on cultural attributes, and they can sort the material artefacts of culture into three general attribute areas: popular, high, and folk culture (Krumrey, 2019).

People respond to their relationship with pop culture in both interesting and complex ways. They both resist pop culture and actively consume it. Pop culture is an economic force that influences how people get information about and understand other cultural groups (Krumrey, 2019).

According to the study by Fraculj & Lekaj (2021), when respondents were shown two pictures of the same product with different representations, they always liked the pop culture version better. Below is a table depicting their preference test results.

Figure 5: Preference test results

Choose the marketing communication version you like more.		
	I like the first version more 27 (14,4%)	I like the second version more 124 (66%)
	I like both versions equally 24 (12,8%)	I don't like either version 13 (6,9%)
	I like the first version more 127 (67,6%)	I like the second version more 8 (4,3%)
	I like both versions equally 34 (18,1%)	I don't like either version 19 (10,1%)
	I like the first version more 63 (33,5%)	I like the second version more 70 (37,2%)
	I like both versions equally 8 (4,3%)	I don't like either version 47 (25%)

Source: Fraculj & Lekaj (2021)

They concluded that consumers prefer marketing communication that contains elements of pop culture. In the examples with the Google Doodle logo and LEGO ads with art paintings, respondents clearly opted for the versions with elements of popular culture. Those versions of marketing communications received about two-thirds of the votes.

The next game theory matrix will simulate a simple game showcasing how brands can use game theory tools and methods for deeper analysis of interactions with their client. Such a view can help us better understand relationships and search for the optimal combination of strategic decisions that lead us to optimal outcomes. For this game, the examples shown in the table above depicting the jacket with a human and Baby Yoda and a Google home screen will be used. The numbers (percentage) were taken from the study done by Fraculj and Lekaj (2021)

First, in general, let us denote by p_1 the percentage of those who prefer a product that utilises pop culture and by p sub 2 the percentage of those who prefer a product that does not utilise pop culture. Let p_3 denote the percentage of those who like both approaches. If a company uses pop culture in its product, let us denote the cost of using it by C. Each acquired customer, on average, brings some gross profit, which is denoted by the pr_{avg}. Assume that the number of potential followers is *F*.

Companies A and B have the strategy of using pop culture in the development of their product (YES) or not using it (NO) available to them. Below, a general representation of the strategic matrix with outcomes can be seen.

In case they have the same strategies, they will divide clients from a potential base. In this case the number they divide is $(p_1 + p_3) * F$ if they play YES, or $(p_2 + p_3) * F$ if they play NO. In case they play different strategies, they will divide only those that like both, with and

without pop-culture. That number is $p_3 * F$ and the one that plays YES will gain additional $p_1 * F$ customers while the one that plays NO will gain $p_2 * F$ additional customers. In Figure 6 in the strategic matrix are calculated outcomes for every combination of decisions in terms of net profit gain.

Figure 6: Game theory strategic matrix – general representation

Source: Authors' work

Figure 7: Game theory matrix in case Black Jacket

	A	
B	Yes	No
Yes	-585, -585	-213, 713
No	713, -213	378, 378

Source: Authors' work

In the game depicted above, using the formulas from Figure 6., two players are A and B, and the product they sell is a Black Jacket (see Figure 5 and Figure 7). Suppose the cost of the pop culture campaign is C=1000 euros. Every new follower gives on average pr_{avg} =2 euros gross profit (some of them will buy some product if they will be the followers). Consider that there is a pool of F=1000 potential followers. Using the percentage from Figure 5 and formulas from Figure 6, the strategic matrix in Figure 7 is constructed.

In this case, pure Nash Equilibrium is achieved when both players play a strategy without using pop culture and gain revenue of 378.

In the new game depicted below, two players are A and B and the product Google Doodle logo (see Figure 5 and Figure 8). The cost of the pop culture campaign is again C=1000 euros Every new follower gives $pr_{avg} = 2$ euros gross profit (some of them will buy some product if they will be the followers). Again, consider that there is a pool of F=1000 potential followers.

The strategic matrix in Figure 8 is constructed using the percentage from Figure 5 and formulas from Figure 6.

Figure 8: Game theory matrix in case Google Doodle

		A	
		Yes	No
B	No	416, 448	272, 272
	Yes	-212, -212	448, 416

Source: Authors' work

In this case, Nash Equilibrium occurs if one player uses pop culture while the other does not. In that case, the player who uses pop culture gains 448, and the other gains 416.

This simple game illustrates how brands might make strategic decisions in the context of social media marketing. Each brand aims to maximise net profit by choosing different engagement strategies and considering its competitors' potential actions. This is how game theory can provide insights into how brands can strategically interact in the social media world to achieve their engagement goals and use the maximum available. Game theory, as a tool, helps in further understanding the data and guides decision-makers to optimal choices. A consolidated view through the mechanisms of game theory allows market participants to clearly understand the market situation and make decisions, adjusting their strategies as needed.

In the two simplified examples above, the concept of game theory aids in determining whether to choose pop culture as a strategy for attracting followers and increasing engagement. It is important to clearly define the payoff function and incorporate all key variables to calculate possible outcomes. In the first example, the optimal combination of strategies is for both players not to use pop culture in their strategic decisions. In the second case, it is optimal for only one of the players to use pop culture as a strategy for attraction. In this case, it was about a battle of the sexes game. It is a coordination game where players need to employ strategic moves (most often promises and commitments) to achieve the optimal outcome.

Generally, the first step is to predict possible followers depending on the strategy being played. Survey results can also be used for prediction (as in our example). After that, key variables are defined, based on which the payoff function is determined. Using the payoff function, outcomes are calculated depending on the type of strategy chosen. Based on the results obtained, the Nash equilibrium is sought, and a combination of strategies is used to achieve the optimal outcome.

Key findings obtained from the research

Based on the case examples provided in this paper, the steps and strategies for leveraging pop culture in social media were examined. These steps serve as a practical guide for brands and content creators who wish to boost their engagement and relevance.

Game theory can significantly contribute to understanding and improving social media engagement, particularly when incorporating pop culture references. It can also help with understanding user behaviour, strategic decision-making, competitive analysis, A/B testing, content personalisation, and long-term engagement strategies.

Incorporating pop culture references into these game-theoretic strategies can make a brand become more relatable, enjoyable, and shareable. By understanding the 'rules' of the social media 'game' and how their customers respond to pop culture, brands can create more engaging and effective campaigns.

Table 1 clearly shows how the aspect of social media marketing can be viewed through the lens of game theory. In the realm of social media, there are studies demonstrating the application of game theory, but in most cases, these involve the use of evolutionary game theory. There is a lack of representation of the basic application of game theory and the simple tools it offers. The goal of this paper was not to delve into the depths of application but to encourage conscious use of the theory and to highlight its value. As observed, the application of game theory in pop culture (movies and TV shows) is varied, but if it were used consciously, its full potential could truly be utilised.

Table 1: Aspects of social media marketing and game theory

Aspects of social media marketing	How game theory helps
Understanding User Behaviour	Game theory models analyse user decisions and motivations.
Strategic Decision-Making	Helps predict outcomes of different strategies
Competitive Analysis	Assists in understanding competitive dynamics
A/B Testing	Guides the design of experiments to test strategies
Content Personalization	Tailors content to individual user preferences
Long-Term Engagement Strategies	Encourages thinking about ongoing engagement

Source: Authors' work

Considering all the steps mentioned in this paper, below is a methodological framework with steps that brands need to take to elevate their engagement and which is the best approach when it comes to using pop culture and game theory concepts in their social media strategy.

This is another added value of this paper, which can be seen through a theoretical framework (Figure 9) for integrating pop culture into social media campaigns. This model emphasises touching on game theory at every step and how it helps us fully leverage the theory's potential in each step.

By following these steps, brands can create a dynamic and effective approach to engaging their audience, creating more meaningful connections with their customers, and staying relevant in the ever-evolving digital landscape. The steps mentioned provide a guide for brands who wish to use pop culture effectively in their social media campaigns. Brands can navigate the intersection of pop culture and social media with confidence and ultimately achieve higher engagement and a captivating digital presence. As pop culture continues to

shape our world, it becomes an invaluable tool for brands to connect with their audience in a more memorable, unique, and meaningful way.

Figure 9: Steps for integrating pop culture in social media campaigns.

Steps for integrating pop culture in social media campaign	Description	
Step 1: Understand your target audience	Identify audience demographics and pop culture preferences to tailor your content.	**GAME THEORY**
Step 2: Align with your brand values	Ensure that pop culture references align with your brand's values and image for consistency.	
Step 3: Create engaging content	Develop engaging and creative content that effectively incorporates pop culture references.	
Step 4: Be authentic	Ensure that pop culture references feel authentic and natural, avoiding any forced content.	
Step 5: Leverage hashtags and trends	Utilize relevant hashtags and trending topics to increase the visibility of your content.	
Step 6: Collaborate with influencers	Partner with influencers who have expertise in pop culture for content creation and promotion.	
Step 7: Encourage user-generated content	Encourage your followers to create and share their own pop culture-related content related to your brand.	
Step 8: Monitor and adapt	Regularly monitor the performance metrics of your pop culture content and adapt to changing trends.	
Step 9: Stay consistent	Incorporate pop culture consistently into your content strategy to maintain relevance.	
Step 10: Adapt to feedback	Listen to audience feedback and be willing to make necessary adjustments to your strategy.	
Step 11: Plan for long-term engagement	Build and maintain a sustained brand presence in pop culture to ensure long-term engagement.	

Source: Authors' work

It is important to incorporate game theory into every step of developing a social media strategy that leverages pop culture. By applying game theory principles, brands gain insights into competitive dynamics, user behaviours, and their competitors' strategic choices. This deeper understanding enables brands to craft more effective and engaging content that resonates with their target audience. Moreover, game theory allows for the optimisation of content strategies through testing and analysis, ensuring that brands stay ahead in the ever-evolving landscape of social media.

Conclusion

This paper examined the fusion of pop culture, social media, engagement, and game theory practices. It showed how brands can enhance their engagement, and these insights provide a practical guide for both brands and their audience.

The paper explored the game theory and its dynamics regarding social media, mainly highlighting the strategic elements and how to use them to the brand's advantage. By understanding the roles of different players, brands can choose their best strategy to win their audience over.

As has been seen, there are many examples of the application of game theory in pop culture. In most cases, the author of the application is probably not even aware that they are applying some theory. This paper highlights and makes it clear that by consciously applying it, better effects can be achieved, considering the methods of game theory that are offered. Bearing in mind the use of pop culture in social media to attract new followers, this significance becomes even greater. Besides making strategy designers aware that they are in the environment of game theory, it opens the door for them to seek optimal decisions and analyse mutual interactions through the quality design of strategic matrices, i.e., to use the right tools of game theory consciously.

This is both a key contribution of this paper and a novelty in existing research. Although the model in this paper is simple, it clearly demonstrates the possibilities of the theory, which was also the goal.

In a world where attention is short and fleeting, the ability to connect with an audience is vital. Integrating pop culture into social media strategies is a powerful tool for achieving this task.

The specific contributions of this paper are a detailed and comprehensive consolidated review of the use of game theory in pop culture and a methodological framework with detailed steps in implementing a social media campaign focusing on game theory at every proposed step in the framework.

The objective of this paper is to encourage more extensive research into game theory in this field. It also addresses potential future improvements of the research conducted in this study, as potential future enhancements. A more detailed analysis of possible applications of game theory with more complex definitions of payoff functions and the use of more complex optimisation models in calculating optimal decisions is suggested. The paper presents a model of a simultaneous game, and the application to sequential games appears as a possible further improvement of this research.

Also, future research directions include the choices of variable combinations from Figure 6 (F,C,p_1,p_2,p_3 and pr_{avg}) and finding the optimal combination of these variables to maximise net profit, as well as calculating the equilibrium of mixed strategies (in case the game is played multiple times).

The research has shown that there isn't much relevant scientific content that demonstrates the potential of game theory in integrating pop culture and social media. This has opened up a new area of research and encouraged a deeper study of game theory in this field, which is also one of this paper's scientific contributions.

References

Binmore, K. (2007). *Game Theory*. https://doi.org/10.1093/actrade/9780199218462.001.0001

Doyle, A. C. (1893). *The memoirs of Sherlock Holmes*. George Newnes.

Du, S. (2024). An evolutionary game-theoretic analysis of cooperation strategy between SMEs and cross-border e-commerce platforms considering the cross-network effect. *Kybernetes, 53*(5), 1857-1887. https://doi.org/10.1108/k-09-2022-1316

Fraculj, M., & Lekaj, L. (2021). The Usage of Pop Culture Elements In Marketing Communications. *International Journal of Multidisciplinarity in Business and Science, 7*(12), 46-52.

Güth, W., Schmittberger, R., & Schwarze, B. (1982). An experimental analysis of ultimatum bargaining. *Journal of Economic Behavior & Organization, 3*(4), 367-388. https://doi.org/10.1016/0167-2681(82)90011-7

Krumrey, K. (2019). Popular Culture and Social Media. U K. Krumrey, *Intercultural Communication for the Community College*. Open Oregon Educational Resources. https://openoregon.pressbooks.pub/comm115/

Osborne, M. J., & Rubinstein, A. (1990). *Bargaining and Markets*. Academic Press.

Qualman, E. (2012). *Socialnomics: How Social Media Transforms the Way We Live and Do Business*, 2nd Edition. John Wiley & Sons Inc.

Tadelis, S. (2013). *Game Theory: An Introduction.* Princeton University Press.

Wan, P., Wang, X., Min, G., Wang, L., Lin, Y., Yu, W., & Wu, X. (2023). Optimal Control for Positive and Negative Information Diffusion Based on Game Theory in Online Social Networks. *IEEE Transactions on Network Science and Engineering, 10*(1), 426 - 440. https://doi.org/10.1109/tnse.2022.3211988

Wang, Y., Mei, S., & Zhong, W. (2022). Advertising or recommender systems? A game-theoretic analysis of online retailer platforms' decision-making. *Managerial and Decision Economics, 43*(6), 2119–2132. https://doi.org/10.1002/mde.3513

Wu, B., Yuan, T., Qi, Y., & Dong, M. (2021). Public Opinion Dissemination with Incomplete Information on Social Network: A Study Based on the Infectious Diseases Model and Game Theory. *Complex System Modeling and Simulation, 1*(2), 109-121. https://doi.org/10.23919/csms.2021.0008

Wu, J., Li, H., Cheng, S., & Lin, Z. (2016). The promising future of healthcare services: When big data analytics meets wearable technology. *Information & Management, 53*(8), 1020-1033. https://doi.org/10.1016/j.im.2016.07.003

About the authors

Mirko Talajić received a PhD in Information Sciences from the University of Novo Mesto, Faculty of Information Studies, Slovenia. Before that, he obtained a degree from the Faculty of Science, University of Zagreb, with the title "Professor of Mathematics". Following that, he received a Master of Science degree in the field of economics at the Faculty of Economics and Business, University of Zagreb, majoring in International Economics. Currently, he leads a department of data management and analytical system development within one bank. Additionally, he is a lecturer on data science and game theory courses at Algebra University, Zagreb. The author can be contacted at **mirko.talajic@algebra.hr**

Ilko Vrankić, PhD, is a Full Professor of Microeconomics and Advanced Microeconomics at the Department of Economic Theory, Faculty of Economics and Business, University of Zagreb. His current research areas are mathematical modelling of economic phenomena and dual approaches to optimisation problems in microeconomic theory. He is the (co)author of many articles in international and national journals. The author can be contacted at **ivrankic@net.efzg.hr**

Lucia Matić received a master's degree in digital marketing at Algebra University, Zagreb. Currently, she works as an account executive at Bruketa&Žinić&Grey. The author can be contacted at **lucia.matic@algebra**