GAME THEORY AND ITS APPLICATION TO FERDOWSI'S SHAHNAMEH

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Abstract:
Hakim Abulghasem Ferdowsi's Shahnameh (Epic of the Kings) is one of the greatest literary works of the East. In addition to high literary values, this work has had prominent effects on the preservation of the Persian language and culture after the Muslim conquest of Persia. In terms of strategic sciences, it can be regarded as an unrivaled work. Besides investigating the importance of Shahnameh from the strategic perspective, the present study aimed to analyze five important stories of Shahnameh from the perspective of game theory, and to discuss Ferdowsi's view towards wisdom and thinking, i.e., strategic thinking.
Keywords: Game Theory, Stable, Dynamic, Shahnameh, Strategic Thinking, Trust, Hamlet, the Stag Hunt.

INTRODUCTION:

The game theory considers interactions among two or more people and is built upon rational choice theory, which looks at the choice of a single individual. The key concept of game theory is strategic thinking. This theory attempts to model the mathematical behavior of a strategic situation (conflict of interest). Such a situation emerges when a player's success depends on the strategies chosen by other players. The purpose of this science is to find the optimal strategy for players. This theory is a branch of applied mathematics, which is extensively applied in social sciences especially in economics, biology, political sciences, international relations, computer science, marketing, and philosophy, etc.

Game theory was first introduced as an independent discipline by Von Neumann. The works of Von Neumann and Oskar Morgenstern on this field were published in a book entitled "Game Theory and Economic Behavior" in 1944 [1]. In 1950, the first mathematical discussion of the prisoner's dilemma game appeared and experimental researches were undertaken in this regard. Around this same time, John Nash developed the definition of optimal strategy by which equilibrium could be found in any non-cooperative game, which was known as the Nash equilibrium [2, 3]. Game theory experienced a flurry of activity in the 1950s, during which many concepts such as fictitious play, extensive form game, and repeated games were developed, with extensive applications in philosophy and political sciences. In 1965, Reinhard Selten introduced the concept of subgame perfect equilibria, which further developed the Nash equilibrium [4]. John Harsanyi introduced the concept of imperfect information and the Bayesian game [5, 6, 7]. In the 1970s, game theory was extensively applied in biology, largely with the works of John Maynard Smith [8]. In the 1980s, game theory was more focused on revisions and development of the previous thoughts, including the development of repeated games, the Nash equilibrium, and bargaining theory [9, 10]. In the 1990s, several authentic sources on the game theory and its applications were published [11]. In 2003, behavioral game theory as a play was developed, which linked game theory to cognitive sciences [12]. Recently, game theory has been extensively applied in other sciences as well [13, 14].

Game theory and literature have been long intertwined, and some game theorists have analyzed literary works; for instance, the works of Von Neumann and Morgenstern (1944), and Palumbo-Liu (2009) who believed that humanities should be considered a technical discipline. **Another work in this regard is the interdisciplinary studies between game theory and humanities by Michael Suk-**

Young Chwe (2009) on Jane Austin's literary works that have extensively influenced Western literature [15].

One of the most important works in this field is the books and articles by Steven J Brams about game theory and humanities [16].

Unlike the long and rich history of Eastern Literature, there is limited research on its modeling. There are limited studies in this regard; for instance, studies on the romantic story of Leyli and Majnun [17], and some computer games were designed based on popular beliefs [18].

The present study sought to investigate the epic work of Hakim Abolghasem Ferdowsi, as an Eastern work, and to model some of its important stories using the game theory.

In this regard, Ferdowsi can be regarded as a game theorist in analyzing and telling the epic stories of Shahnameh because he analyzed the decision-making process and strategic thinking in a systematic and theoretical manner [19].

One of the most important principles emphasized by Ferdowsi in most of his epic and mystical stories is wisdom and strategic thinking. For example, he showed, in the story of Zahhak-e Mardoosh (Zahhak the snake shoulder) and Kaveh Ahangar (Kaveh the blacksmith) and the symbol of Derafsh Kaviani, any dictatorship can be defeated by strategic thinking and unity. Using the strategic thinking technique, he considered three factors of a government downfall as oppression, enhancing subordination, and avarice, which, with a little reflection, it is revealed that these factors are associated with irrationality and lack of strategic thinking. On the other hand, Hakim Toos asserted that the people who enjoy a higher level of wisdom and stronger strategic thinking will be blissful [20].

Ferdowsi is known as the teacher of Iranian culture and protector of the Iranian race. The great scholars of world literature may be very prominent in their known works from a professional point of view, but Hakim Abolghasem Ferdowsi not only created a literary masterpiece, i.e., Shahnameh, but it saved the Iranian language and culture from definite destruction. The symbol of Derafsh Kaviani is regarded worldwide as the symbol of unity and is especially known among the Persian-speaking as the symbol of nationalism and patriotism. This, in turn, has played the role of awakening the people around the world. Also, Zahhak-e Mardoosh, as a dictator who considered the people to be deprived of strategic thinking and wisdom, was finally overthrown by the same people [21].

Ferdowsi considered five principles of human guidance as follows: 1. Theism,

2. rationality, 3. Justice, 4. Nickname (fame), and 5. Happiness. Rationality refers to strategic thinking that can be described in Shahnameh in three parts: a) Monarchical strategic thinking, b) heroic strategic thinking, c) social strategic thinking. Ferdowsi wished that people in all periods and all over the world would live proudly with these human traits. People will be happy if they follow Ferdowsi's strategic thinking as their model of life [22].

Therefore, Ferdowsi was both a strategic thinking theorist and the thinker of the stories of Shahnameh, who has been unparalleled from the social scientists' perspective. Anyone who reads the Shahnameh in its entirety can find a clue to the human principles proposed by Ferdowsi, which can play a miraculously major role in a person's life.

This hidden and unique secret is the feather of the Simurgh. Ferdowsi described that Zal, the father of Rostam, borrowed three feathers of the Simurgh, one of which he burned for the birth of Rostam, and another one for the healing Rostam's wounds in the war with Esfandiyar to ask the Simurgh's assistance.

The third feather was not used for saving Sohrab's life or even Rostam's life in the battle of Rostam with Shaghad. The secret of this feather, in Ferdowsi's view, was the secret hidden in mythical stories of Shahnameh, which is left to the readers and is indeed the identity of every Iranian.

The existence of such secrets in Shahnameh saturated it with rationality, wisdom, and strategic thinking, affecting human progress and development. Though monarchical strategic thinking is of importance for kings, and heroic strategic thinking is important to elites, Ferdowsi considered social strategic thinking in his stories and sought to reveal Iranian identity from the depths of Persian civilization, history, and behavior and pass it to the next generation [23, 24].

It is no exaggeration to claim that the Iranians would not speak Persian if the Shahnameh had not been written in Persian. He can be regarded as the savior of the Persian language and culture, and the Shahnameh can be regarded as the symbol of the Iranians' Iranianism [25]. That is why it has been called the Persian Quran since poets such as Saadi, Hafiz, and Moulavi emerged after it. As Hakim Toos asserted:

For thirty years exceeding toil, I bore

And made the Persians live in Persian lore

Making an analogy between Ferdowsi and other great literary scholars, it can be said that Hakim Toos not only has tremendously affected the ideas and thoughts of anyone, from kings and elites to ordinary people but also he indeed saved a language and a culture from destruction. The strategic heritage of Ferdowsi led to the unity and integration of Iran [26, 27], and such strengths and distinctions of Hakim Toos compared to other great scholars or the world literature give him a special place.

1. **The influence of Ferdowsi's strategic thinking on other cultures and civilizations**

Ferdowsi's Shahnameh is known as the national identity document for the Iranian. This masterpiece is the essence and foundation of Iranian civilization and culture for two thousand years. It is considered an epic work that is organized into three mythological, heroic, and historical parts [28].

Shahnameh is not only a mythological, historical, and cultural story, but also a way of living and governing based on strategic thinking for human beings. It has been translated into most living languages of the world. The works of Victor Hugo, Lamartine, Coupe seem to be influenced by Shahnameh [29]. It is considered as the best embodiment of a cultural renaissance of Iran in the 4th century AH, which has a special place not only in its time but in all historical periods. Its epic stories depict the three categories of objectivity, mentality, and emotion which are the main concepts in strategic thinking.

The Shahnameh scholars have compared Shahnameh and Ferdowsi's special viewpoint and his strategic thinking with famous epics such as Gilgamesh, Iliad, Odyssey, Aeneid, Chanson de Roland, Nibulngen, Ramayana, and Mahabharata to reveal its epic and literary value.

Ampere Jean Jacques (19th century), the French writer and literary critic, called Ferdowsi as Homer of Iran in the two essays he published in 1839 in the Two World Journal [East and West], and the Collection of Sciences and Literature in the Orient, and considered the Shahnameh superior to Ramayana and Mahabharata and other Indian epics [30].

Sir William Jones, an English orientalist, compared Ferdowsi to the Greek Poet Homer in a treatise on Oriental literature published in 1771. Other scholars have conducted several studies on the issue of strategic thinking and translating the Shahnameh [31].

The Shahnameh as a prominent and valuable work can provide the opportunity for interaction between Iran with other Persian-speaking countries [32], as it has affected epic works of the West and other civilizations [33, 34].

In the 19th century, several studies have been conducted on Ferdowsi in Germany, including Fritz Wolf, the German researcher, who divided his work into fifty chapters based on the kings of the Shahnameh, which is considered by Jalal Khaleghi Motlagh as the most important work on the Shahnameh [35, 36].

The fact is that Ferdowsi did not create stories adds to the value of the Shahnameh. Rather, he imagined them; therefore, the Shahnameh should be identified as the mirror of the history and true thoughts of the Iranian people [37].

The present study used the rules of 2×2 sequential games [38] to draw tables for the stories selected from the Shahnameh. The following payoffs go for the worst, bad, good, and the best move: a) the worst payoff (1), b) the bad payoff (2), c) the good payoff (3), and d) the best payoff (4).

2. The Story of Siyavash

Once Toos, Giv, and Gudarz go hunting and see a beautiful woman. they cannot decide on who should possess her for his pleasure, and a major dispute erupts between them. Finally, they decide to take her to the Shah, Kay Kavus. The Shah decides to keep her as his concubine and Siyavash is the result of their union. The Shah decides to send him to Rostam, the ultimate hero of Iranian mythology, for training in the arts of riding, archery, hunting. After several years of instruction, Siyavash asks Rostam's permission to return to Kay Kavus's Court. At first, Siyavash is well received at Court because of his youthful good looks and his mastery of the arts, and the Shah even appoints him Ruler of Kohestan after seven years. Astronomers described his fate as unhappy and sinister.

One day, Kay Kavus and Siyavash sit in the palace. Suddenly, Sudabeh, the Shah's wife, comes in. She develops an instantaneous, and all-consuming sexual desire for the young prince, and starts a series of the plan to entice him to enter her chambers. But, Siyavash is not impressed. The Shah, due to his wife's insistence, insists that Siyavash goes to Sudabeh's chamber. In her chambers, the Queen organizes a magnificent reception for Siyavash, with expensive perfumes, pieces of jewelry, and make-up. The prince realizes that the Queen's insist was the result of her lust. So, he refuses to get close to the Queen.

Sudabeh asked the Shah to order Siyavash to choose one of the ladies in the Queen's chamber. Siyavash once more goes to the Queen's chamber. Sudabeh proposes he make a covenant with her that Siyavash is engaged falsely with an immature girl, and the Queen serves him as a nurse. She proposes to have her husband, the Shah of Iran, murdered so that she and Siyavash can rule together and live romantically, but he refuses to have anything to do with her. Queen Sudabeh realizes that Siyavash might reveal her plans to her husband. She then runs to the Shah, ripping her robes, screaming, wailing, and crying. The Shah is deeply disturbed by the sight of his wife, bloodied and in tatters. The Queen accuses Siyavash of attacking and raping her. She provides the aborted fetuses, which she ordered the witches to find, as evidence of his violence towards a pregnant Queen. The Shah ordered both to ride through the blaze of fire to prove their innocence. Anyone innocent will emerge unscathed. Sudabeh refuses to do so and claims that abortion of her fetus proves her innocence and only Siyavash has to prove his innocence. Siyavash obeys the rule and emerges from the fire unscathed and victorious. Kay Kavus, the Shah, orders the immediate execution of the Queen but Siyavash begs for clemency, so he forgives his wife [20].

This game is similar to the game described by Hamlet, which was named by Branz for the first time (for more information, see To Do or Not To Do: Game Theory and Literature) [39].

The game of Sudabeh and Siyavash is a stable sequential game, which is modeled by the 2×2 games table.

Players:

1. **Sudabeh**
2. **Siyavash**

The strategies are as follows:

    a) Sudabeh

C: she tries to make Siyavash love her, try to get close to her. She tries to help Siyavash to seat on the throne.

D: opposing Siyavash's reactions to achieve the goal of her desire for Siyavash.

    b) Siyavash

C: agrees to marry Sudabeh and seating on the throne

D: refuses Sudabeh's proposal

The outcomes and payoffs of Sudabeh and Siyavash's selected strategies, based on the story:

1. (C.C) if Sudabeh offers friendship to Siyavash and he accepts it and cooperates with her. Thus Sudabeh gains the highest payoff (4) but the outcome for Siyavash will be bad with the payoff (2), according to the conditions described in the story.
2. (C.D) If Sudabeh offers friendship to Siyavash but he refuses to accept. The outcome for Sudabeh will be the worst payoff (1), and Siyavash will gain the best payoff (4).
3. (D.C) If Siyavash himself accepts Sudabeh's proposal but Sudabeh does not cooperate with him. In this situation, according to the real conditions of the story, the outcome for Sudabeh is good payoff (3) because she meets her desire, but the outcome for Siyavash is the worst payoff (1).
4. (D.D) If Sudabeh does not insist on her desire and Siyavash refuses her proposal. The outcome for Sudabeh is bad payoff (2) and for Siyavash is good payoff(3) because his goal is to refuse Sudabeh's proposal.

The outcome of the game based on the players' preferences is as follows:

Siyavash prefers to refuse Sudabeh's proposal, i.e., he prefers strategy D to strategy C. on the other hand, Sudabeh prefers strategy D to strategy C in this situation. Eliminating the Nash equilibrium, the game is(D, D) which is realized in the story.

The story of Siyavash and his father, which is a dynamic game, is represented in the tree of the game. This game is the trust game.

The trust game, designed by Berg et al. (1995), and otherwise called "the investment game" [40]. However, it can be said that the trust game is developing in behavioral economics. Ferdowsi depicted a new type of trust game more than 10 centuries ago. The form of players' payoff differs from trust studies in references because, in this story, trust refers to the honor and dignity of Siyavash's father,

not money and material things. In the story, Siyavash was accused of Sudabeh's rape and abortion of her fetuses. So, the Shah, Siyavash's father, ordered him to ride through the blaze of fire to prove their innocence.

Players:

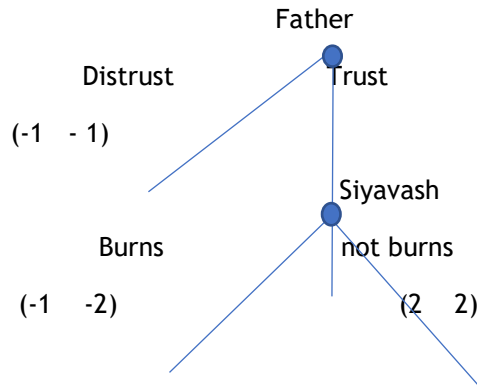1. Kay Kavus (Siyavash's father)
2. Siyavash

Kay Kavus and Siyavash's strategies are as follows:

Kay Kavus's strategies:

a) He does not trust his son and punishes him.
b) He orders Siavash to ride through the fire to trust him.

Siyavash's strategies:

a) He burns by riding through the fire.
b) He emerges from the fire unscathed.

If the father does not trust Siyavash (the branch of distrust) and punishes him, both father and Siyavash's payoffs are -1. If the father orders Siyavash to ride through the fire (the branch of trust), there are two situations:

a) In the branch of burns, Siyavash obeys and rides through the fire and burns. Then, the father's payoff is -1, and Siyavash's payoff is 2, which is not good for both.
b) In the branch of not burns, Siyavash rides through the fire and emerges wholly unharmed. Then, the payoff for both father and his son is 2. This is the best choice as happens in the story, causing more trust of the father to his son, and the father realizes his son's honesty. Due to Siyavash's honesty and chastity, the Shah orders the execution of the Queen for her lies and slanders against Siyavash and the problem she made, but Siyavash begs his father to forgive the Queen.

4. The story of Iraj, Salm, and Tur

Fereydoun who dethroned Zahhak to finally liberate Iran from his oppressive rule becomes the Shah of Iran. He had three sons: Salm, Tur, and Iraj. He is too old, so he divides the world between his sons. He hands over the west (Rome) to Salm, the eat to Tur, and Iran to Iraj. After some time, Salm and Tur felt jealous of their brother, Iraj. Therefore, they write to their father to protest and ask him to change his mind. The father informs Iraj of his brothers' evil intention. Iraj decides to visit them and invites them to unity, unanimity, and love, and assures them he will abdicate for their will hand over the crown. The father writes a letter to his other two sons, asking them to respect Iraj and appreciate his pure intentions and respect their father's decision of division. Iraj tries to invite his

brothers to reconcile, but the enraged Tur breaks his throne over Iraj's head, pulls a dagger from his boot, and kills him. Iraj's head is sent to the Shah. Freydoun becomes very upset and decides to revenge but the wise prevent him. Years later his death is avenged by his grandson Manuchehr [20].

This game is a stable sequential game that is modeled based on the 2×2 games table. This game is similar to that of the Blackmail story [41].

Players:

1. The brothers (Salm and Tur)
2. Iraj

The strategies selected by Iraj and his brothers are as follows:

a) The brothers

C. The brothers cooperate with Iraj and accept his invitation for peace and compromise.

D. The brothers do not pay attention to Iraj and his father and try to murder Iraj.

b) Iraj

C. He compromises with his brothers and hands over the crown.

D. He opposes and fights his brothers.

The payoffs of Iraj and his brothers' strategies are analyzed based on the table:

1. (C.C) The brothers compromise with Iraj and accept his invitation for peace, and Iraj compromises too, then the payoff for the brothers is bad (2) and for Iraj is the best choice payoff (4) because the brothers are not going to compromise.
2. (D.C) The brothers compromise with Iraj but Iraj refuses to compromise and fights with them. In this situation, the brothers have the worst choice payoff(1) and Iraj has a good choice payoff(3).
3. (D.C) The brothers do not compromise and fight with Iraj, but Iraj compromises. Then, the brothers have the best payoff (4) and Iraj has a bad choice payoff(2).
4. (D, D) The brothers do not compromise and fight with Iraj and make him fight. Then, the brothers' payoff is good (3) but Iraj has the worst outcome payoff (1) because the brothers are going to fight with Iraj.

The outcomes are explained based on the players' preferences.

The brothers prefer to refuse compromise. They prefer a fight over peace. But Iraj prefers compromise. The Nash equilibrium is (D.C), i.e., what happened in the story. That is, Iraj decides to compromise but the brothers are not going to compromise. The outcome of the game is very good for the brothers but bad for Iraj.

5. The story of Bijan and Manijeh

One day that while Kay Khosrow and his men were shortening the hours with wine there entered in unto them the keeper of the curtains of the door. And he said that men from Arman stood without and craved an audience. The Kay Khosrow base that they are let in. So the men came before him, and they uttered cries of lamentation, and they fell at his feet and implored his aid. They said they are there because wild boars break into their fields and do destruction to their crops, and no man can overcome these beasts. Then, Kay Khosrow said that whoever would go forth to combat the wild boars can have precious presents. But no one answers but Bijan. The Shah orders Girgin, the wise in counsel, to guide him because Bijan does not know how to get to Turan. And Bijan did as the Shah desires and they set forth unto the land of Arman. After killing the boars, Girgin said that I know that at the near distance lies the garden of Afrasiyab, where his beautiful daughter, Manijeh, comes. At the sight of Bijan, Manijeh welcomes him and receives him with joy for some days. When the time comes to quit the garden, Manijeh who has fallen in love with Bijan gave him a cup of wine that caused him to sleep and takes him to the palace of Afrasiyab. When Bijan awakes, he is first afraid but he forgets his fears in her love. After some time, Afrasiyab is told about Bijan and orders to hang him. However, well-aware of the possible fight between Iran and Turan, Afrasiyab changes his mind and orders to throw Bijan into a deep well, and the opening of the well is closed with a mighty stone, i.e., Akwan Deev. Afrasiyab lets Manijeh be out of her wealth on the opening of the well take care of Bijan. As such, Manijeh is on the well from early in the morning and does her best to prepare a meager meal for him, to give it to her dear detained at night. Then, Kay Khosrow writes a letter to Rostam and asks him to rescue Bijan from Turan. So, Rostam obeys the order and takes Bijan and Manijeh to Khosrow's palace [20].

According to the 2×2 games table, the game of this story is based on the game of the stag hunt, which describes the conflict between safety and social cooperation. In the story of Bijan and Manijeh, the trust and intention of both (Bijan and Manijeh) is love and living together, which should not be deviated for short-term interests and joy. Achieving this outcome requires patience, cooperation, confidence, and trust between the two. Therefore, living together requires goodwill and benevolence, otherwise, selfishness destroys both. This can be analogized with the stag hunt originated with the philosopher Jean-Jacques Rousseau, based on which both hunters know the only way to successfully hunt a stag is with the other's help [41].

The game of Manijeh and Bijan is a stable sequential game, which is modeled based on the 2×2 games table.

Players:

1. Bijan
2. Manijeh

The strategies selected by Bijan and Manijeh are as follows:

a) Bijan

C. He falls in love with Manijeh and accompanies her.

D. He does not fall in love with Manijeh and forgets her.

b) Manijeh

C. She loves Bijan and does not give up on Bijan and loves him even she loses her life and wealth.

D. She does not love Bijan and does not care about him.

The outcome payoffs of the strategies selected by Manijeh and Bijan are obtained and analyzed as follows:

1. (C.C) Bijan falls in love with Manijeh and Manijeh accepts his love. Then, both have the best outcome payoff (4).
2. (C. D) Bijan falls in love with Manijeh but Manijeh does not accept. Then, the outcome for Bijan is bad payoff (1) and for Manijeh is good payoff(3).
3. (D. C) Bijan does not fall in love with Manijeh, but Maijeh loves him. Then, the outcome for Bijan is good payoff (3) and Manijeh has the worst outcome payoff (1).
4. (D. D) Bijan does not fall in love with Manijeh, and Manijeh does not either. Both have a bad outcome payoff (2).

The analysis of the game outcome, based on the players' preferences, is as follows:

If Bijan selects cooperation and Manijeh selects cooperation, and if Bijan rejects to cooperate and Manijeh rejects to cooperate, it can be said that both have two-sided cooperation. In this game any action selected chose by Bijan is chosen by Manijeh as well. This game analogizes with the stag hunt game and has the two Nash equilibrium (C, C) and (D, D) as it happened in the story.

6. **The story of Rostam and Sohrab**

One day Rostam goes hunting to his favorite hunting ground on the border between Iran and Turan. Tired, he goes off to sleep leaving Rakhsh, his horse, to graze on his own. Some Turk soldiers of the king of Samangan see the horse and take it to the king. When Rostam wakes up and does not seem like Rakhsh, he becomes upset. Following the traces of his lost horse, he enters the kingdom of Samangan where he becomes the guest of the king during the search for his horse. The king asks Rostam to enjoy his hospitality and Rostam agrees. When two-thirds of the night passes, a beautiful girl enters his room and tells him that she is Tahmineh, the princess of Samangan and since long she loves the great Rostam on account of his mastery in martial arts and deeds of bravery. She requests him to marry her. So, Rostam sends for a wise man who conveys the desire of the two to get married to the king. The king arranges a ceremony for the two. His Rakhsh was found, too.

After a few weeks, Rostam informs Tahmeineh about his departure and she informs him that she is carrying their child. He gives a gemstone to Tahmineh, requesting her to tie it in the hair, if the child is a baby girl, and on the forearm, if the baby is a boy. And he returns to Iran.

In due course of time, Tahmineh gives birth to a baby boy and names him Sohrab. As he grows up, he kept inquiring with his mother about the identity of his father, but the mother always managed to evade the answer. She finally confines to him and reveals that he is the son of Rostam. The mother revealed why she has kept it a secret; she has feared that the father may call him for warfare, and she cautions Sohrab against the treacherous Afrasiyab and his army and asks to stay away from them.

Sohrab is bubbling with ambition, and says "I will defeat Afrasiyab, and Kay Kavus and instate my father as the Shah of Iran". Afrasiyab is informed of Sohrab's intention and sends an army with Human and Barman for Sohrab and asks his men to conceal Sohrab's identity from Rostam so that Sohrab will kill his father and Sohrab will be killed when he goes to bed. Afrasiyab writes a letter and sends it and many precious presents to Sohrab by Homan. Homan and Sohrab go toward the border of Iran and Turan and get to a fort named Sepid. Hazhir who was the custodian of the fort was defeated and imprisoned by Sohrab within the blink of an eye. Then, Kay Kavus asks Rostam to fight with the Turanian army. So the Iranian soldiers along with Rostam and other paladins march towards the fort of Sepid which Sohrab has captured and where the Turanian army is stationed. The Iranian army is stationed some distance away from the fort of Sepid. At dusk, Rostam decides to go to the fort in disguise to take stock of the situation in the enemy camp and get any information possible. He hides in a dark corner and spots Sohrab sitting calmly discussing the stratagems of war. Zindeh-razm, one of the heroes from Samangan, sees some movement in the corner where Rostam is hiding so he goes to investigate. Rostam immediately silences him and deals a powerful blow to his neck, rendering him lifeless. When Sohrab realizes that Zindeh-razm has not returned for a long time, he sends an attendant, who returns with the tragic news of the death of Zindeh-razm. Sohrab immediately realizes that an intruder has entered the palace. He tells his men to prepare for the war. Rostam returns to his camp and gives the news of war preparations in the enemy camp to Kay Kavus.

The following day, Sohrab and Hazhir climb to a strategic point from where they can take stock of the Iranian army. He asks Hazhir to identify the different tents. Hazhir properly identifies the tents of all other paladins, but when he comes to the tent of Rostam, he lies that the tent was that of a newly recruited warrior from China. Hazhir intended to protect Rostam from any unsuspecting attack by the enemies. When Sohrab asks about Rostam, he answers that he is in Zabolestan. Thereafter, Sohrab speeds off alone towards the Iranian camp and challenges Kay Kavus to send any of his warriors to fight him. But no one can dare to fight with him. Thus, on receiving the urgent message of Kay Kavus in his tent, Rostam immediately prepares himself for the battlefield. Both the great warriors come face to face with each other and Rostam suggests going to a secluded place for a duel. While on the way, Sohrab feels affection towards Rostam and asks him whether he is Rostam. Rostam replies that he is a small warrior in comparison to the great Rostam. The two great warriors start their duel, first with spears and swords, and then with mace and bow-arrows. The duel is so fierce but none prove superior to the other. So they decide to meet again the next day. Sohrab is feeling a strange attachment towards Rostam. He asks Homan if that man is Rostam because he dreads the possibility of actually fighting against his father since he finds in Rostam the evidence his mother explained about his father.

The following day Sohrab and Rostam meet again. Sohrab once again appeals to Rostam to reveal his identity but Rostam refuses to reveal his true identity, and replies that "we are going to wrestle". So they start the battle. Within no time Sohrab flings Rostam to the ground and sits on his chest. As he is about to pull out a dagger to kill Rostam, Rostam played a trick on him. He stops Sohrab saying that it is against Iranian rules of war to strike the opponent the first time he is flung to the ground. Sohrab lets Rostam go. When Sohrab returns to his camp and narrates the incident to Homan, he tells Sohrab that "you are deceived". On the other hand, Rostam goes to spring and washes his face and hands and prays to God, and asks for strength. He gets back his strength and meets Sohrab the next day in hand-to-hand combat.

With renewed strength, Rostam starts fighting Sohrab and soon gets an upper hand over him. At the first opportunity, he toppled Sohrab on the ground and before the winking of an eye thrusts a dagger in his side. He cries against Rostam and laments that now he will have to end his life without being able to see the face of his father. He warns Rostam saying that his father Rostam will find him and take revenge. Rostam was shocked to hear this. He asks Sohrab about any evidence that he is Rostam's son and Sohrab rips open his armor and shows him the gemstone tied to his arm, and his mother sent Zindeh-razm to identify his father. When Rostam sees the gemstone, he screams in agony. Suddenly,

Rostam realizes that King Kay Kavus has a medicine be the name "Nushdaru". He requests Goodarz to get it urgently. But the king declines to give it as feared that if Sohrab survived, Rostam gets more powerful and will not obey him. So Rostam personally goes to request the king for the medicine, but he received the news that Sohrab was no more in the world, and Rostam grieves uncontrollably [21].

This game is a stable sequential one that is modeled here. It is similar to the game of Hamlet by Shakespeare [39, 40].

Players:

1. Rostam
2. Sohrab

The strategies are as follows:

a) Rostam

C. He reveals his identity to Sohrab and refuses to fight.

D. He does not reveal his true identity and fights with Sohrab.

b) Sohrab

C. refuses to start to fight Rostam.

D. he fights Rostam.

Based on the story, the payoffs of the strategies selected by the players are analyzed as follows:

1. (C. C) Rostam reveals his identity and does not start a battle with Sohrab, and Sohrab agrees. Then, the outcome for Rostam is bad payoff (2) and for Sohrab is the best payoff (4).
2. (C. D) Rostam reveals his identity and does not start a battle with Sohrab, but Sohrab does not agree and fight Rostam. Then, the payoff of Rostam's outcome is the worst (1) and that of Sohrab's is good (3).
3. (D. C) Rostam does not reveal his identity and fights Sohrab but Sohrab asks him to reveal his identity. Then, since Sohrab hopes to find his father but Rostam does not reveal his identity, the outcome of Sohrab's choice is the worst payoff (1) but that of Rostam's choice is the best payoff (4).
4. (D. D) Rostam does not reveal his identity and starts a fight with Sohrab and Sohrab cannot find his father and starts a fight with Rostam. Rostam's choice brings a good outcome for him payoff(3) but Sohrab's outcome is badpayoff (2).

The outcome of the game, according to the players' preferences, is as follows:

If player 1 cooperates, then player 2 will cooperate, too. However, if Rostam does not cooperate, Sohrab will not cooperate. The outcome (D. D) represents the Nash equilibrium, i.e., the lack of Rostam's cooperation with Sohrab, as narrated in the story.

Rostam refused to reveal his identity to Sohrab because he dreaded the possibility of Iran's disintegration because, according to the letters Rostam had received from Sohrab's mother, he could not imagine such a great warrior as his son. On the other hand, Sohrab and Rostam's enemy, Afrasiyab, had attacked Iran for destruction, and Afrasiyab tried to conceal Sohrab's identity from his father to conquer Iran; in addition, Rostam's position as the hero of the Iranians was at danger because his defeat could weaken the Iranian corps. All of these matters, along with king Kay Kavus's refusal to give "Nushdaru", caused Sohrab's death. Therefore, the story of Rostam and Sohrab is one of the most important, famous, and monumental stories of the Shahnameh, left for the world, the Iranians, and Persian-speaking countries.

7. Conclusion

Since the field of literature is not confined to scientific and academic textbooks and articles in specific fields of study, it has important applications in different fields such as economics, sociology, behavioral sciences, politics, international relations, etc., used for the education and development of human generations. Regarding historical and cultural richness, Ferdowsi's Shahnameh has had a considerable effect on the culture and language of Central Asian countries and the world.

In the first verses of the Shahnameh, Ferdowsi taught theology, and then he discussed the importance of wisdom and strategic thinking asserting that the best blessing God has given to human beings is wisdom. Hakim Toos considered wisdom as the first blessing created by God, which brings peace and guide to human beings.

Wisdom is the guide and encouraging

Wisdom helps the man in both worlds

Therefore, it is time for Persian literature researchers to communicate with other researchers and experts in the world through the game theory, and to model and introduce the valuable literary works of Iran to the world by mastering interdisciplinary knowledge. We expect this study to be a starting point for the application of the Shahnameh stories in various sciences.

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