Prisoner's Dilemma: an IBICT's Approach

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Abstract. The prisoner's dilemma is a classical example in game theory and may be considered a simple illustration of rationality's failure. Despite that, it is actually that seemingly inconsistency that attracts so many studies and applications such as cooperation and reciprocity. This work presents a four dimensional model for choice that is derived from IBICT – Internet-Based Information Consumer Theory. Some variant examples of prisoner's dilemma are presented, where the four dimensions are identified. A four dimensional prisoner's dilemma is proposed and its equilibrium is clearly efficient in the Pareto's sense.

Keywords: Choice behaviour, consumer preference, IBICT, object value system, prisoner's dilemma.

1. Introduction

Ariel Rubinstein in his afterword to the sixtieth-anniversary edition of von Neumann and Morgenstern [1] said that the Prisoner's Dilemma expresses a trivial idea, that is, "that there are situations in which selfish behaviour can ultimately hurt all participants". Additionally, still talking about game theory, he stated

When we teach game theory we may be affecting the way people think and behave in economic and strategic interactions. Is it impossible that the study of game theoretical considerations in economics makes people more manipulative or more selfish?

Additionally, in a book review by James Der Derian [2], he shared his experience teaching world politics class at Gardner State Prison, "Needless to say, I was the one who was taught a lesson". He also said that "The fact that they were all doing serious time in a medium-security prison suggested that their critical wisdom about the prisoner's dilemma came one crime too late". They performed their own experiment, where the inmates insisted on setting it up on their own. From the yard, they enlisted unsuspecting "volunteers" to engage in classroom prisoner's dilemma games. Derian then reported

By the end of the exercise, they had effectively deconstructed the realist premise of the prisoner's dilemma (that rational actors in the absence of authority always seek to maximize their self-interest) as well as the behavioralist assumption of evolutionary tit-for-tat learning. By contrast, these students – relying on reputation, perception, and intuition – proved adept at regularly predicting outcomes that defied the conventional strategic logic of the game. In subsequent reviews, they explained how traditional codes of silence, pre-scripted stories, and other intersubjective rituals of honour – all specific to their prison society – defied generalization into timeless, reductionist, instrumentalist (i.e. rationalist) principles.

These two quotations suggest that the prisoner's dilemma is still an up-to-date research topic. A search on Scholar Google with the query "prisoner's dilemma" limited to the year 2012 returned 238 results [3], where it can be noticed that, for instance, the prisoner's dilemma is receiving a lot of attention when applied to the study of cooperation and reciprocity [4]-[8].

Moreover, in 2011 the film "Tower Heist" [9] has a scene in its end where two characters face a kind of "prisoner's dilemma" situation. One of them offers the other millions of dollars for omitting certain information, and the other character refuses it assuring that the first would stay in prison for several years while he spends two years in jail. This situation had not affected the public, which can be inferred by the public's lack of reaction to it. That is, they had accepted the film's plot and argument as rational.

This paper attempts to show that Derian report in [2] and "Tower Heist" [9] are related. Indeed, Letouze and Oliveira in [10], [11] presented IBICT – Internet-Based Information Consumer Theory, where they have suggested that Baudrillard's object value system can become a cardinal utility function, that is, a consumer

choice may have four dimensions, the four object values of Baudrillard [12]-[14]. Hence, herein Baudrillard's work is applied to the prisoner's dilemma.

The author organized this paper in accordance to the IMRAD structure: introduction, methods, results and discussion; which is adopted as part of the Uniform Requirements for Manuscripts Submitted to Biomedical Journals of the International Committee of Medical Journals Editors, 2008 update. The author believes that adopting this structure would help search engines in international databases to store and to retrieve information within research papers in order to facilitate meta-analyses and systematic reviews.

2. Methods

This work uses Baudrillard's object value system to understand the problem. It explores IBICT's approach and its suggestion that choice behaviour may be a four dimensional cardinal function. Therefore, in this section the prisoner's dilemma and IBICT are presented as the methods used in this paper.

2.1. Prisoner's Dilemma

Myerson in [15] presents the Prisoner's Dilemma in a very concise way and he remarks that it is an example of equilibrium that is not efficient, in Pareto's sense:

The two players are accused of conspiring in two crimes, one minor crime for which their guilt can be proved without any confession, and one major crime for which they can be convicted only if at least one confesses. The prosecutor promises that, if exactly one confesses, the confessor will go free now but the other will go to jail for 6 years. If both confesses, then they both go to jail for 5 years. If neither confesses then they will both go to jail for only 1 year.

Then he remarks that

If Nash equilibrium can be interpreted as describing how rational players should play a game, then rational individuals should expect to all do relatively badly in this game. This example has been very influential as a simple illustration of how people's rational pursuit of their individual best interests can lead to outcomes that are bad for all of them.

A more interesting story can be used to describe the dilemma, as in [16] by Dixit and Skeath, where the players are husband and wife accused of kidnapping followed by murder of a young woman. The choices and outcomes are summarized in Table 1, where "defect means to defect from any tacit arrangement with the spouse, and cooperate means to take the action that helps the spouse (not cooperate with the cops)" [16].

Table 1: Prisoner's Dilemma.

		Wife	
		Defect	*Cooperate*
Husband	Defect	10 yr, *10 yr*	1yr, *25 yr*
	Cooperate	25 yr, *1yr*	3 yr, *3yr*

Dixit and Skeath in [16] explain that from the husband's (or wife's) point of view his (or her) best choice is to confess regardless of his (her) belief about his wife's (her husband's) choice, that is, confess is a dominant strategy. Then they state:

If an action is clearly best for a player, no matter what the others might be doing, then there is compelling reason to think that a rational player would choose it. And, if an action is clearly bad for a player, no matter what the others might be doing, then is equally compelling reason to think that a rational player would avoid it. Therefore dominance, when it exists, provides a compelling basis for the theory of solutions to simultaneous-move games.

Their comment just expresses a widely accepted understanding of the problem. Additionally, about altruism or public-spiritedness in experiments, they say that players' behaviour in some experiments does not often agree with Nash equilibrium, that is, "people seem to *err* on the side of niceness or fairness". They conclude that the reason may be that players' payoffs are different from those assumed by the experimenter

and that "participants in experimental situations also may know some complexities of the situation better than the experimenter knows them", or

The players' value systems may have internalized some social norms of niceness and fairness that have proved useful in the larger social context and that therefore carry over to their behaviour in the experimental game. These observations do not show any deficiency of the Nash equilibrium concept itself. However, they do warn us against using the concept under naive or mistaken assumptions about people's payoffs; it might be a mistake, for example, to assume that players are always driven by the selfish pursuit of money.

2.2. IBICT – Internet-Based Information Consumer Theory

In Letouze and Oliveira's work [10] and [11], they proposed an interpretation for Baudrillard's object value system for the Internet, the dimensions are:

- *Functional*: it is the utility value of the information for the Internet user. That is, how useful the information is to the Internet user.
- *Exchange*: it is the economical value of the information. For instance, it is the value to buy or sell an advertisement, product, service, book, article, etc.
- *Symbolic*: it is the value that a subject assigns to information in relation to another subject. That is, it is the credibility of information provided by a subject to the Internet user who is receiving it, observing that a subject may be an Internet user, an institution, a company, etc.
- *Sign*: it is the value of the information within a system. For example, a website for selling third parties products may have rankings or labels that provide additional assurance over the quality or reliability of the third party seller which may influence the Internet user to buy its product, even if there is a cheaper seller in the same site, but without the label or in a lower rank.

They remarked that if an object has four value dimensions, then it is almost immediate to imagine a vector space model for it. Hence, a cardinal utility function could be:

$$\Phi_{value}(x) = w_1 \, \phi_1(x) + w_2 \, \phi_2(x) + w_3 \, \phi_3(x) + w_4 \, \phi_4(x) \tag{1}$$

where "x" is the object, "w_1, w_2, w_3, w_4" are weights, i.e., real numbers, and "$\phi_1, \phi_2, \phi_3, \phi_4$" are functions that assigns value to each Baudrillard's value dimensions – indexes 1 for *Functional*, 2 for *Exchange*, 3 for *Symbolic* and 4 for *Sign*, that is, we have an utility function for each value dimension.

3. Results

In the previous section, an example of how Baudrillard's object value system can become a utility function is presented. Nonetheless, before performing a similar approach as IBICT to the prisoner's dilemma, an interpretation must be done about choice behaviour. Thus an interpretation of the four dimensions for choice could be:

- *Functional*: it is the measure of how useful a product, service or information is to the player. An example would be Table 1, that is, freedom may be considered the useful service.
- *Exchange*: it is the economical value of a product, service or information that the player may obtain. An example would be the scene in the "Tower Heist" movie, where millions of dollars are offered for hiding information (book).
- *Symbolic*: it is the value that a player assigns to a product, service or information in relation to another player. Again an example would be from the movie "Tower Heist"; the main character chooses to go to prison favouring its workmates/friends instead of getting the proposal of hiding the information, that is, his personal relationships are more important to him than money.
- *Sign*: it is the value of a product, service or information within a system to a player. An example would be Derian's Garden State Prison experience, where for the inmates there exists "codes of silence, pre-scripted stories, and other intersubjective rituals of honour – all specific to their prison society", that is, the prison society is the system.

Consequently, choice would be a combination of all four dimensions and function (1) could be a possible representation of a cardinal utility function that expresses consumer preference. Furthermore, for

simplification sakes, in all four examples it could be understood that one of the four dimensions is a dominant dimension, that is, the choice is based on only one dimension.

Now, as an example of evaluating the four dimensions at the same time, let's propose a four dimensional prisoner's dilemma, Table 2. Let's say that the couple had also stolen (or got from the kidnapping) 2 millions of dollars, and they had hidden it. Therefore, if they come out together from prison, then they share the money, otherwise the first gets all. Also, let's consider that they are part of a secret society where betrayal is punished by death, that is, if one snitches then other members of the society may kill the one who breaks the society's code. Finally, let's consider that if the husband confesses then the wife will love him for that, otherwise she will hate him; and vice-versa.

Table 2: Four dimensional prisoner's dilemma.

(Husband, *Wife*)		*Wife*							
		Defect				*Cooperate*			
		ϕ_1	ϕ_2	ϕ_3	ϕ_4	ϕ_1	ϕ_2	ϕ_3	ϕ_4
Husband	Defect	10 yr, *10 yr*	1 m, *1 m*	Hate, *hate*	Death, *death*	25 yr, *1 yr*	0 m, *2 m*	Hate, *love*	Life, *death*
	Cooperate	1 yr, *25 yr*	2 m, *0 m*	Love, *hate*	Death, *life*	3 yr, *3 yr*	1 m, *1 m*	Love, *love*	Life, *life*

The result of this modified prisoner's dilemma is quite clear for both players, they will cooperate. It can be argued that the death penalty is dominant, but 25 years of imprisonment seems a lifetime too, so if one of the players feels sufficiently old, it may seem that he or she would not live enough to leave prison. That is, one million dollars does not seem enough for risking your life; when comparing one or three years of imprisonment, it seems reasonable to choose staying three years and get it all as a couple, instead of getting one extra million dollars and a death warrant from a secret society.

4. Discussion

The answer to Ariel Rubinstein's question "Is it impossible that the study of game theoretical considerations in economics makes people more manipulative or more selfish?" is: it depends on how game theoretical considerations are taught. If it is considered only the functional or exchange dimensions then probably the student learns to be selfish and manipulative. However, if it is recognized that other dimensions are important, that means, it is rational to consider "subjective" factors as love and death, then cooperation and reciprocity are natural and valuable concepts that the student may learn.

The prisoner's dilemma seems to be a good example of how teaching a theoretical modelling may influence the outcome of an experiment and how it does not correspond to reality in so many cases. Researches have been extensive in counter-examples and attempts in explain why it does not fit to reality. Hence, the four dimensional prisoner's dilemma shows that to consider other dimensions such as symbolic and sign are reasonable. Furthermore, the four choice dimensions explain every example presented in here.

Finally, the four dimensions of choice (functional, exchange, symbolic and sign) support Dixit and Skeath argument in [16] by highlighting the other dimensions of payoffs and "The players' value systems", that is, Baudrillard's object value system is actually the players' value system. Thus the question is:

How should all four dimensions be measured and combined when analysing a game or making a choice?

5. References

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