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Choice decision under uncertainty for fee-charging video-on-demand services

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Abstract

This study focuses on using fee-charge video-on-demand services and reveals how people react when there are two uncertainties in decision making. Conducted economic experiments show that the choice rate of subscription video-on-demand service increases as the expected utility of watching videos grows. The experiments also show that the two uncertainties affect our decision making, but with a difference in degree.

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1. Introduction

The current methods of delivering video contents can be classified into three types. These are sales of packages, rentals, and video-on-demand. Video-on-demand means all services that are delivered through the Internet, IP networks, or electric waves in the broad sense. However, in this paper, this does not include what users upload by themselves, but refers to sites, which deliver content from content providers and can be accessed using PCs, smartphones, tablets, etc. According to the transition of times, shipment value of former two types has been annually decreasing [1]. Considering the trend of reduction in the video-content market, the video-on-demand market expands, owing to the spread of broadband and development of video-on-demand services from PC to TV or smart phones [1]. However, questionnaire surveys from prior study estimate that there are few individuals that watch fee-charging videos, which is why video-on-demand services do not become widespread [1]. From the point of view of numbers, compared to the number of those who watch free videos (i.e., 50% of the total) the number of those who have used fee-charging video-on-demand services is about 10%. Therefore, users of these services are still limited.

Consequently, this study focuses on the effective use of the service from the viewpoint of users of fee-charging video-on-demand services. It is assumed that there are two uncertainties for choice decision in using fee-charging video-on-demand services. Investigations have already been conducted on risk attitude towards certain uncertainties. For example, Laury and Holt [2] study human risk attitude using the lottery and show that we tend to be more risk averse when the reward is known. As such, they investigate the change in the attitude towards risk with decreasing and increasing the reward. In this paper, risk aversion is considered normal human behavior, when exposed to uncertainty, as an attempt to reduce that uncertainty. It can also be considered as the reluctance of a person to accept a bargain with an uncertain payoff rather than another bargain with more certain, but possibly lower, expected payoff. The cited study [2] suggests that the change of the attitude towards risk does not appear as long as reward was not paid, but we get more risk averse when paid reward increased. On the other hand, Harrison and Rutstrom [3] study the appearance of human attitude towards risk in a controlled experimental environment. According to them, some are risk neutral, some are risk averse, but few are risk loving. Moreover, Wieland and Sarin [4] study risk attitude focusing on gender. They propose

that women tend to be more risk averse than men if the probability of the result is known. Lopes and Oden [5] compare two models, cumulative prospect theory (CPT) and security-potential/aspiration (SP/A), and suggest that the SP/A model was more valid. However, CPT is the model that introduces the reference point and SP/A introduces the aspiration level as second criterion in the choice process. Inman, Dyer, and Jia [6] define two new evaluation axes: depression and regret. They consider next action as affected by not only a selected lot but also by not selected lots when it comes to considering the utility of the lottery question. Similarly, there are many more investigations on the attitude towards risk. However, our decision making changes according to the surrounding conditions, and there are few investigations on the risk attitude toward the choice decision of using video-on-demand services.

Our main objective is to investigate the risk attitude toward the choice of using video-on-demand services and make suggestions for the real services. First, we construct the choice decision model of fee-charging video-on-demand services, and, second, we conduct an economic experiment on how choice decisions are made under uncertainty. Finally, we reveal how the two uncertainties affect our use of service.

The remainder of the paper is organized as follows: section 2 presents the theoretical model; section 3 is dedicated to the experimental design and procedures; section 4 analyzes the results; section 5 presents the discussion points; and section 6 draws conclusions.

2. Model

This study verifies the fee-charging video-on-demand service from the three perspectives: charge setting, time constraint, and content, which is decided according to the result of the questionnaire survey [1] to the non-service-user of prior study.

2.1. Charge Setting

There are two types of fee-charging systems used in fee-charging video-on-demand services: subscription video on demand (SVOD) and transactional video on demand (TVOD). In real services, either system or both can be used. This study considers services that adopt two types of fee-charging systems and analyzes which system service users choose in various situations.

2.2. Uncertainty about available number of videoactive users

Fee-charging video-on-demand services are assumed to be used during spare moments in one's daily life. This study presumes that we select fee-charging systems a month before use and defines how many videos we can watch in the subsequent month as the available number of videos (ANOV). The models defined in this study assume that those who choose fee-charging systems do so under uncertainty about ANOV. Consequently, we analyze how ANOV affects users by

comparing two types of models, which are different in terms of ANOV uncertainty.

2.3. Uncertainty on content watching satisfaction obtained

For watching videos, fee-charging video-on-demand service is used. Videos give us mental satisfaction, such as interest, impression, etc. This study defines the index of mental satisfaction when watching a video as video value (VV). The models assume choosing fee-charging systems under uncertainty of VV. As such, we analyze how VV affects us by comparing two types of models, which differ in terms of VV uncertainty.

Service users make decisions in the model. First, the fee-charging system is chosen. Second, videos are chosen. ANOV is determined after the first step, and VV is determined after the second step.

2.4. Profit

In fee-charging video-on-demand services, there are two fee-charging systems, SVOD and TVOD. SVOD allows us to watch any video freely during a certain period of time by charging price f . On the other hand, TVOD requires us to pay price c each time we watch a video. There are S number of videos available, whose contents are constant regardless of the fee-charging system. Each video has its VV $R_j (j = 1, 2, \dots, S)$.

The number of video services the user is able to watch in the fixed term is s . R_j and s are probabilistic values of the service user. In this paper, $(A, a; B, 1 - a)$ means phenomenon A occurs with probability a , and phenomenon B occurs with probability $1 - a$. Subsequently, the service user can comprehend R_j and s as $(R_{j1}, p_j; R_{j2}, 1 - p_j)$ and $(s_1, q; s_2, 1 - q)$. s_1 and s_2 are constrained as follows: $s_1 < S, s_2 < S$. $a_i = (a_{i1}, a_{i2}, \dots, a_{iS})$ is the choice of what service user i wants to watch. $a_{ij} = 1$ means one decides to watch a video and $a_{ij} = 0$ means one decides not to watch a video. From the above, when SVOD is chosen, the utility is

$$U_i^S = \sum_{j=1}^S a_{ij} R_j - f, \quad (1)$$

and when TVOD is chosen, the utility becomes

$$U_i^T = \sum_{j=1}^S a_{ij} (R_j - c). \quad (2)$$

3. Experimental design and procedure

3.1. Experimental Design

Economic experiments are conducted using this choice decision model. In the experiment, two types of treatment were implemented: sequential and collective treatment. These are different in how video-choice is made. Each treatment has three parts, R-change, S-change, and SR-change. R-change is the experiment in which only VV is uncertain; in S-change only ANOV is uncertain; and in SR-change both VV and ANOV are uncertain. Table 1 summarizes each experiment's

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