An Appraisal of Pricing Criteria by Information Producers in Iranian Scientific Research Centers

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A B S T R A C T

The emergence of knowledge economy has increased diversity of intellectual services and prepared new opportunities in business for scientific research centers. The purpose of this paper is to examine the pricing criteria for information goods by Iranian scientific research centers. The research method was descriptive and statistical population included all experts of these centers in Tehran. Cluster Sampling Method was used in order to select research sample and in addition to reviewing books, journals and websites, a researcher-made questionnaire was provided. Structural equation analysis and Friedman's analysis of variance were used to analyze the data**.** Findings of factor analysis showed that information producers in Iran scientific and research centers mostly use the components of market structure, competition, cost, cultural and time factors as criteria for information pricing. Information producers also pay more attention to cost-oriented, competitive-oriented, marketing and sales promotion variables in pricing goals.

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1. Introduction

Over the last half century, the world has been greatly affected by technological advances. In the realm of economics, the conventional classification of wealth-producing factors has changed, and human mental products are being traded as new commodities. Thus, economics has been confronted with the emergence of new phenomena such as "knowledge-based economy" and "knowledge workers" that are closely related to production and intellectual property (Radovich and Bieln-Katik, 2014). In fact, the distinction between a knowledge-based economy and a traditional economy is not limited to the production process and shows a different nature in all aspects of business. In traditional economics, business development followed a uniform, linear, and slow process. Thus, the choice of type of goods was mostly based on desire of the producer. The product life cycle was long and the range of competition operated mainly locally and regionally. Marketing was homogeneous and the changeability of activities was slow. Also, the main source of competitive advantage was easy access to raw materials, cheap labor, and reduction of production costs. But in a knowledge-based economy, due to technological progress and competition, economic development is undergoing drastic changes and the life cycle of goods is short-lived.

Also, the choice of product is more customer-oriented. The main market operators are knowledge-based companies and start-ups and range of competition is international with flexible marketing programs, and a variety of goods and prices. In addition, the main source of competitive advantage is availability of special human resources capabilities, and strategies for production, distribution and sale of goods are dynamic (Kolahi, 2014). Also, in a knowledge-based economy, most of the goods are information resources that are the result of human intellectual activities. According to the World Bank, a knowledge-based economy consists of four components: education and human resources, the system of inventions and innovations, information infrastructure, and economic and institutional regimes (White, Concours & Argoza, 2012).

In the meantime, existence of right information infrastructure in a country increases the production and development of intellectual ideas that people can enter the business market and enjoy its benefits (Petrokzi et al., 2007). Thus, information and communication technology, by creating more capacities for knowledge-based goods, causes the development of information businesses (Raghfar, Shah Abadi, Alizadeh, 2017). In fact, the emergence of knowledge economy is

consequence of parallel and related presence of several important factors in the contemporary world: the emergence and rapid development of new information and communication technologies, rapid growth of demand for technology-based products, knowledge capitalization, and emergence of intellectual property legal systems (Khaleghi and Azar Gashsab, 2018). Accordingly, the pivotal role of knowledge in the new economy created a strong connection between education system (especially higher education) and service sector. In the past, education system was considered only as an institution that has two missions: the production of human resources and science (Renhar, 2016), but in modern economies, this system in addition to the traditional task, through knowledge-based companies, science and technology parks, and companies and information centers creates wealth (Gorsell, 2014).

With the help of technology, these new institutions have made many changes in various areas of life. One area of influence is method of information acquisition which in the traditional economy was mainly through the publishing industry. With the advent of Internet and e-publishing, information acquisition has undergone fundamental changes in all aspects of its production, distribution, sales, and pricing. In fact, changing the way we obtain information leads to the emergence of "information goods" and attention to issues such as production and distribution methods, sales mechanisms, pricing methods and criteria, producer and customer rights in the new business field called "Information Services"; institutions whose main purpose is to make a profit through production, supply and sale of information goods. Information goods are products that can be transferred digitally through information networks such as computer software, books and electronic publications, databases, music, movies, television programs, and search engines (Chang and Yuan, 2006). Some of the unique features of information goods are:

- *Lack of erosion*: Indicates that information goods, unlike physical and analog goods, do not deteriorate over time
- *Ease of copying*: Indicates that the influence of information technology makes it easy to copy almost any piece of information.
- *Network effect*: Indicates that increasing users will lead to more customers.
- *Experimental use*: Indicates that it is possible to test a product before deciding to purchase it (Wang, 2004).

Due to these unique features and increase use of information goods, attention to information services and its economic aspects has expanded. For the first time since the 1960s, for-profit information services have been established in libraries, mostly in scientific institutes, but there has been very little official research on them - compared to other areas of librarianship and information. In 1983, the first conference on for-profit information services was held at Long Island University, and the second conference was held in 1987 at the University of Michigan. The third and fourth conferences reviewed for-profit information services in 1992 and 1997, respectively (Fang and Deri, 2003). Naturally, one of the topics of interest at these conferences was pricing criteria set by the producers.

The issue of price itself is very complex, and many factors affect product or service prices. Therefore, entering the subject of price in a specialized field - such as technology - will add to the complexity of subject. In addition to issues such as supply and demand, competition, bargaining power, financial rules and regulations, and political-economic situation also affect the price. Price and its criteria naturally lead us to the concept of marketing. Marketing involves elements related to its goals. These elements are: product, price, location and promotion. The concept of price is one of the four pillars of marketing and one of the effective factors on maintain and attract customers' satisfaction(Azadi Ahmadabadi and Azadi Ahmadabadi, 2012; Ulanitis, Iodonas, 2007). Therefore, one of the overlooked aspects of the knowledge economy is the pricing of information resources and services.

Pricing is a continuous process. This sustainable process is due to environmental changes and instability of market conditions, which reveals the need for price adjustment. Pricing is done with aim of maximizing profits, increasing market share, leadership of quality, continuing life of job and increasing prices (Pennsylvania State University, 2007). In today's highly dynamic knowledge-based market environment, along with product change, marketing strategies must also change (Shipley, 2001). There are different approaches to pricing. Three of the most well-known of are cost-based approach, competitive-based approach and customer-based approaches (Stevens, 2006). Some experts also cite three groups of factors that affect pricing. First, organizational factors - dealing with the organization's resources and goals; Second, customer factors - which show the impact of customer on pricing - and third, market factors - which affect the price on the market (Azizi, 2002). However, in business decision making, pricing is part of a comprehensive competitive

strategy because it can have a significant impact on current and future performance of a company or institution.

Given what has been said, it is necessary to take a brief look at the growing market situation of information goods in Iran. The first point to note is the role of knowledge economy in acquisition of regional power. Based on the "Iran's 20-Year Vision Document", Iran should be developed as a country with the first economic, scientific and technological position in the region of Southwest Asia (Shahid Beheshti University, 2009). This shows the careful attention of policymakers to the role of two important factors of science and technology in national development. However, research findings show that the Islamic Republic of Iran has not been very successful in moving towards a knowledge-based economy (World Bank, 2012). In fact, Iran has faced many problems and issues in its path towards development and has not been able to achieve the goals set out in its upstream documents in the Fifth and Sixth Development Plan (Abedi, Bab al-Hawaiji and Hassanzadeh, 2017). However, in the last two decades, dozens of scientific and research institutes have been established throughout Iran that are producing scientific products in the form of books, articles, reports and other types of intellectual products. Naturally, one of the goals and priorities of the managers and staff of these institutions is to sell these products based on realistic pricing criteria.

Despite the quantitative growth of information production institutions and centers - especially in the last three decades - little research has been done on the goals, dimensions, and pricing criteria. Few existing studies have explained the common approaches to pricing goods and services without directly contacting the managers or staffs of financial affairs and pricing of these institutions (Chang and Yuan, 2006; Pennsylvania State University, 2007; Gursel, 2014; Viswanathan , 2005; Chen and Seshhadri, 2007; Soleimani, 2014; Khaleghi and Azargashsab, 2019; Atapour and Naderi, 2008; Azadi Ahmadabadi and Azadi Ahmadabadi, 2012). Therefore, the present study can be first step in identifying criteria for information pricing by financial experts of scientific and research institutes. The sub-objectives of the research are:

• Identify main criteria for pricing scientific information goods
• Identifying goals of pricing scientific information goods in Iran

2. Research Method

The present study is applied in terms of nature and descriptive in terms of method. The statistical population includes all experts of financial affairs for distribution and sale of scientific services in scientific and research centers of Tehran - universities, research centers and government research institutes - (N = 301). To select the research sample, multi-stage cluster sampling method was used and the sample was determined by Cochran's formula (169). In addition to books, publications, and websites, a researcher-made questionnaire was used to collect data. The questionnaire contained 42 multiple-choice questions on a Likert scale. In order to determine the formal and content validity of the questionnaire, opinions of 4 professors of information science and epistemology were collected at the University of Tehran and the Islamic Azad University of Tehran Central Branch. The reliability of the questionnaire was calculated through Cronbach's alpha coefficient and its value was determined to be 0.95. In the data analysis section, Bartlett's index was used to determine whether the variance of the research variables was affected by the common variance of some latent or obscure factors, and it was found that the test was significant because the P-Value was less than 0.01. Also, based on the results of the Kaiser-Mayer -Olkin test (KMO) - which was 0.92 - it is concluded that the research data can perform factor analysis and can be reduced to a number of infrastructural factors. This means that there is a high correlation between the items in each factor, but there is no correlation between the items in one factor and the other factor. Also, in the inferential statistics section, SPPS20 software was used for the completion of Kolmogorov–Smirnov test and Friedman test and LISREL8 was used for confirmatory factor analysis.

3. Results

The results of the data analysis and questionnaire completed by the finance experts of research organizations and institutions are presented separately by the sub-objectives of research. The information related to first sub-objective is given in Tables 1 to 3. The question was "what are the criteria for explaining price of scientific information in Iran". Before examining the data, it is necessary to emphasize that the confirmation or rejection of factor loads is done according to significant numbers (T-value), so that at the error level (0.05) the relationship is confirmed if value of T is greater than 2 or less than -2 (Monazami, 2015).

Table 1
Test of the first question and research model output in significance level of t-value

Pricing criteria	Standardized operating loading	p-value	t-value	Result
Market structure and competition	1.120	Significant	3.314	Accept
Cost	1.120	Significant	2.574	Accept
Customer and demand	1.117	Non-significant	1.678	Reject
Integrated pricing	1.110	Non-significant	0.233	Reject
Entrepreneurial pricing	1.112	Non-significant	1.574	Reject
Cultural factors	1.124	Significant	2.301	Accept
Time factors	1.297	Significant	2.614	Accept
t= -1.96 + 1.96 sig = p> 0.05				

According to results of confirmatory factor analysis of Table (1), market structure and competition criteria, cost, cultural factors and time factors with information pricing have a suitable factor loading and there is a direct relationship between information pricing and these criteria. However, the customer and demand criteria, integrated pricing and entrepreneurial pricing with information pricing have no suitable factor loading and its value is less than 1.96. Therefore, the most important criteria to determine price of information goods according to the research sample are market structure and competition, cost, cultural factors and time factors.

Table 2
 Prioritization of scientific product pricing criteria based on Friedman test results

Number	169
Chi-squared statistic	137.33
Degrees of freedom	169
Significance level	0.000**

Also, according to the results of Table (2) and obtained significant level, which is less than 0.01, the assumption of zero is rejected and it is clear that the pricing criteria of scientific goods do not have the same priority among producers.

Table 3
 Prioritization of scientific product pricing criteria

Criteria	Average rank
Market structure and competition	5.20
Cost	4.63
Customer and demand	4.45
Integrated pricing	4.03
Entrepreneurial pricing	3.73
Cultural factors	2.99
Time factors	2.33

According to results of Friedman's factor analysis in Table 3, the two factors of market structure and competition with an average rating of 5.20 are most important criteria and time factors with an average rating of 2.99 are the least important criteria affecting the pricing of scientific products**.**

The analysis of data related to the second sub-objective of the study on the goals of scientific information pricing in Iran is presented in Table 4.

Table 4
Test of second research question and model output in significance level of t-value

Variables by type of goals	Standardized coefficients	p-value	t-value	Result
Cost-oriented	1.120	Significant	3.522	Accept
Competitive-centered	1.120	Significant	2.139	Accept
Demand-driven	1.115	Non-significant	1.622	Reject
Customer relationship	1.110	Non-significant	0.471	Reject
Distribution network	1.120	Non-significant	1.601	Reject
Marketing investigation	1.118	Significant	2.429	Accept
Advance sale	1.317	Significant	2.537	Accept
Customer service	1.120	Non-significant	1.127	Reject
Distinguish superiority	1.000	Significant	4.280	Accept
t= -1.96 ∞ + 1.96 sig = p> 0.05				

According to the results of confirmatory factor analysis in Table (4), cost-oriented, competitive-oriented variables, marketing investigation and sales promotion as effective factors in pricing goals, have a suitable factor loading and have a direct relationship with information goods pricing. Also, the variables of demand-driven, customer relationship, distribution network, customer service do not have a suitable factor loading and its value is less than 1.96. Therefore, producers of information goods in Iran's scientific and research centers use more cost-oriented, competitive-oriented, market investigation and sales promotion variables based on information pricing goals**.**

Table 5
Prioritization of scientific product pricing criteria based on Friedman test results

Number	169
Chi-squared statistic	138.45
Degrees of freedom	169
Significance level	0.000**

According to the results of Table (5) and obtained significance level, which is less than 0.01, the null hypothesis is rejected and it is clear that the pricing objectives of scientific information do not have same priority.

Table 6
Prioritizing the goals of scientific information pricing

Goals	Average rank
Cost-oriented	52.2
Competitive-centered	4.36
Demand-driven	68.45
Customer relationship	4.03
Distribution network	2.33
Marketing investigation	2.99
Advance sale	28.9
Customer service	16.14
Distinguish superiority	38.54

According to the results of Friedman's factor analysis in Table 6, the demand-driven goal with an average rate of 68.45 is first effective goal and distribution network goal, with an average rating of 2.99, is the last effective goal in pricing scientific information in Iran.

4. Conclusion

Despite the growing number of information goods in the Iran business market, a small number of researches have been done on the goals that affect pricing and its criteria. It also seems that many scientific research centers in Iran have looked at their services less from the perspective of "commercial goods" and have not sought to determine pricing criteria of their information goods and services. A review of the opinion of financial experts of research institutes shows that the process of commercialization of information goods in many institutions has been continuous but slow. Accordingly, the first finding of research showed that the producers of information goods mostly determine the prices of their goods and services based on criteria of market structure and competition, cost, cultural factors and time factors. The second finding shows that price determination criteria are not of equal importance and market structure and competition have the highest priority and time factors have the least role. The third research finding indicates that the most important goals affecting pricing in Iran's scientific and research centers are cost-oriented, competitive-oriented, marketing research and sales promotion. The fourth finding shows that demand-oriented goal is the first effective target and distribution network is the last effective target

for pricing of scientific goods. Given the growth of business market for information commodities and the impact of Quaid 19 infectious disease on closure of universities, schools and libraries - which has boosted the market for information commodity sales (O'Dea, 2020) - current researchers suggest that those involved in scientific and research centers should pay more attention to the goals and pricing criteria of their goods and information services.

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