An analysis of the Input-Output Table in the Sports Industry of Thailand

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ABSTRACT

The study aimed to create and analyze the value of the input-output table in the sports industry in Thailand. The study concerned mainly sports, especially soccer, futsal, and Thai boxing. The sports input-output table, focusing on producer price, was fundamentally consistent with the input-output table 180 x 180 sectors of Thailand. The information was gathered from secondary and primary data using 20 sports activities to create an input-output table for the sports industry in size 200 x 200 sectors. The findings showed that the gross output from soccer was approximately 204,175.58 million baht, futsal was approximately 118,282.13 million baht, and Thai boxing was approximately 126,491.92 million baht in 2017. From these results, soccer was ranked first, followed by Thai boxing and futsal. Considering the gross output of the sports industry in Thailand, accounted for 1.26 percent of the GDP, the intermediate cost accounted for 0.87 percent of the GDP, and value added accounted for 1.76 percent of the GDP. The results confirmed that the sports industry was an important part of Thailand's economy.

Keywords: Sports Industry, Soccer, Futsal, Thai Boxing, Input-Output table

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Introduction

Accordingly, the world has given greater importance to the sports industry because it has become a part of people's lives. Moreover, it also plays an important role in economic and social development (A.T. Kearney, 2014). In the past, sports were an activity or play for fun, enjoyment, and just only for the strength of the body. But nowadays, sports have played an important role in the creation of economic and social value added to various nations, as well as the inheritance of the country's cultural identity.

The sports industry is regarded as one of the country's economic mechanisms, particularly in the production, creation, and development of sports infrastructures, athletes, and various business sectors such as sports clubs, manufacturers, distributors, and academic institutions. All elements are linked together in a systematic value chain from upstream economic activities to downstream business units. The sports industry will be important in terms of household spending, investment, employment, and income distribution.
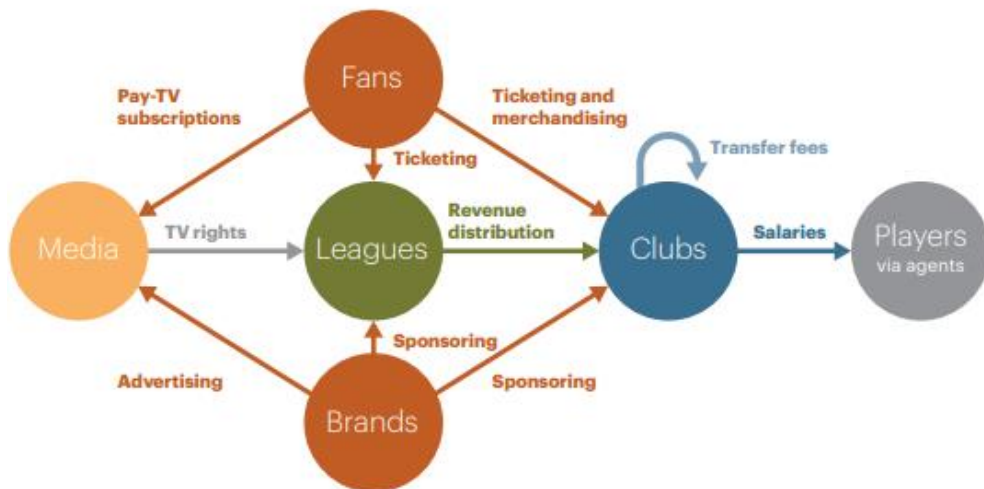

Figure 1 The Sports Ecosystem: the Flow of Money

Source: A.T. Kearney (2014)

The flow of money in Figure 1, sports has become the most important channel in today's fragmented media market. Within the sports ecosystem, leagues played an intermediary role in flowing revenues to clubs, particularly from media rights money. Clubs played a central role in the sports ecosystem. Clubs got their revenues from ticketing, merchandising, sponsorships, and media rights. Then, clubs paid salaries to players via agents.

In 2011, the global GDP was worth 73,448 billion US dollars, while the global sports economy was worth 324 billion US dollars, according to Table 1. However, the value has increased. The value of the world sports economy accounted for 471 billion US dollars while world GDP accounted for 86,357 billion US dollars in 2018. Compared with the growth rate from 2011 to 2018, it was found that the growth rate of the sports economy was an average of 5.49 percent, higher than world GDP was an average of 2.41 percent accounted for 2.2 times. It reflected that the world population concerned with sports was increasing.

Table 1 World GDP, world sports value and percent of growth rate in 2011-2018

(Units: Billion US dollars)

Year	World GDP [1]	Growth rate (%)	World Sports Value [2]	Growth rate (%)
2011	73,448	n.a	324	n.a
2012	75,146	2.31	340	4.94
2013	77,302	2.87	358	5.29
2014	79,451	2.78	376	5.03
2015	75,199	- 5.35	395	5.05
2016	76,336	1.51	421	6.58
2017	81,229	6.41	440	4.51
2018	86,357	6.31	471	7.05
Average	**78,059**	**2.41**	**391**	**5.49**

Source: [1] World bank (2018)

[2] Statista (2018)

Sports values are important to the world economy. Many countries have established the Sport Satellite Account (SSA). SSA measured the sports sector as a percentage of GDP and the effects of sports on employment, value added, and purchasing power such as Japan, Britain, Germany, Austria, Poland, Hungary, the Netherlands, and the Czech Republic (Panagouleas, T.,& Kokolakakis, T, 2012). However, the core of the SSA in every country was the Input-Output table. In simple terms, the SSA focused on the part of the supply and used tables that were related to sports. Consequently, The Sports Input-output Table was an important tool for

analyzing statistical data which was an add-on or extension of the national account by adding code in sports to reflect the structure to reflect the impact in the sub-field to study.

Research Objective and Scope

This paper aimed to create and analyze the value of the input-output table in the sports industry of Thailand. This study expanded on an original Thailand's input-output table with sectoral disaggregation in the sports industry, focusing on the main three sports industries in Thailand, specifically soccer, futsal, and Thai boxing, by using 8 activities and 20 sports activities in Thailand's national I-O table, and then assessing the economic contributions of that industry.

Theoretical and Literature Review

In the 1930s and 1940s, Nobel laureate Wassily W. Leontief developed the input-output table (I-O Table) as a tool for economic analysis for the United States while teaching at Harvard University. Leontief created the I-O Table for the U.S. economy for the years 1919, 1929, and 1939 (Leontief, 1951). Leontief's I-O model was partly inspired by the Walrasian (Leon Walras, 1834-1910) analysis of general equilibrium via interindustry flows, which in turn was inspired by Quesnay's (Francois Quesnay, 1694-1774) Tableau Economique. Both Quesnay and Walras' economic theories were based on the concept of a "closed model." In closed models, all economic sectors are considered both producers and consumers; households are treated as an industry whose output was labor and whose inputs are the commodities it consumes (O'Connor, R.O., & E.W. Henry, 1975). In contrast, Leontief's I-O model recognized that the object of economic activity was the satisfaction of final demand. In the I-O system, final demand (house-hold consumption, government consumption and investment, private investment, and exports) assumed to be determined by outside factors, so the system is called an "open model." As Leontief stated, "Input-output analysis was a practical extension of the classical theory of general independence which views the whole economy of a region, a country, and even the entire world as a single system and sets out to describe and to interpret its operation in terms of directly observable basic structural relationships" (Leontief, 1987).

The preparation of the I-O table was a complex process that involves the collection and integration of data from a variety of sources in a way that provides a meaningful picture of economic activity. In their work, the I-O analysts are guided by three fundamental economic

principles or assumptions that provide the structure and purpose of the formulation and calculation of the tables.

1. Under the *principle of homogeneity*, each industry's output is produced using a unique set of inputs. Thus, in the use table, each industry should be defined so that it has a unique production function. In reality, though, industries produce a variety of products, as is shown in the make table, and these products may require substantially different inputs. As a result, it was not possible to completely achieve homogeneity, but the goal is to approach it as closely as possible.

2. Under the *principle of proportionality*, the ratio of each input to one unit of output remains constant over a wide range of output levels. That is, there are no economies of scale. In the total requirements tables, each commodity has a unique input structure. Thus, under this principle, if the demand for a given product increases by 50 percent, all the inputs required for the product will also increase by 50 percent. This principle enables us to calculate the effect of a change in final uses on the output of all industries.

3. Under the *principle of consistency*, economic statistics are organized and presented uniformly. In particular, the classification of the data shown in the I-O table should be consistent with that used for the underlying source data and the national accounts. The use of a common classification system enables users to effectively compare and analyze data across the broad spectrum of the nation's economic statistics.

The I-O tables are used to study changes in the structure of the nation's economy and to assess the impact of specified events on economic activity. In addition, the I-O table provided the framework for preparing the national and other economic accounts that are used for policy analysis, business planning, and other purposes. Horowitz, Karen J., & Planting Mark A. (2009) said an important use of the I-O table in the estimation of the direct and indirect effects that changes in final uses will have on the industry and commodity output, on employment, or income in Figure 2 and Figure 3.

		Commodities						Total Industry Output
		Sector 1	Sector 2	Sector 3	Sector 4	…	Sector n	
Industries	Sector 1	■						
	Sector 2		■					
	Sector 3			■				
	Sector 4				■			
	…					■		
	Sector n						■	
Total Commodity Output								

Legend: ☐ Total Industry Output ■ Total Commodity Output ■ Primary Product of Industry

Figure 2 Make table: Industries producing commodities.

Source: Authors, adapted from Horowitz, Karen J., & Planting Mark A. (2009).

		Industries						Final Uses (GDP)							Total Commodity Output
		Sector 1	Sector 2	Sector 3	…	Sector n	Total intermediate	Personal consumption	Private fixed investment	Change in Private inventories	Export of Goods and Services	Import of Goods and Services	Government Consumption	Total Final Uses (GDP)	
Commodities	Sector 1														
	Sector 2														
	Sector 3														
	…														
	Sector n														
	Total Intermediate														
Value Added	Wages and salaries														
	Operating surplus														
	Depreciation														
	Indirect taxes less subsidies														
	Total Value Added														
Total Industry Output															

Legend: ☐ Total Industry Output ■ Total Commodity Output

Figure 3 Use table: Commodities used by industries and final uses.

Source: Authors, adapted from Horowitz, Karen J., & Planting Mark A. (2009).

For Thailand, The Office of the National Economic and Social Development Council (NESDC) applied and released the first annual I-O table in 1975. Its initial set of integrated GDP-by-industry accounts and annual I-O table; The table contained the same estimates of gross output and value added for Thailand industries. The Thailand input-output table was a critical component of Thailand's economic accounts. Specifically, the I-O table provided: A set of data on the nation's economy that was closely related to the statistics collected by business—for example, sales and cost of sales; Information on the output of the economy by industry; A consistent set of measures, or accounts, for all sectors of the economy; A cross check for the variety of data used to estimate the national accounts; A cross check for the product and income accounts; and Estimates of final consumption that incorporate the best information available and that was in balance with industry output and inputs.

Table 2 The input-output table model

	Demand			Supply
	Intermediate Demand (Xi_j)		Final Demand (F_i)	Gross Output (X_i)
Intermediate Cost (xi_j)	x_{11} x_{12} $x_{13} \dots x_{1n}$		f_1	x_1
	x_{21} x_{22} $x_{23} \dots x_{2n}$		f_2	x_2
	$\vdots$ $\vdots$ $\vdots \dots \vdots$		$\vdots$	$\vdots$
	x_{n1} x_{n2} $x_{n3} \dots x_{nn}$		f_n	x_n
Value Added (V_j)	v_1 v_2 $v_3 \dots v_n$			
Gross Input (X_j)	x_1 x_2 $x_3 \dots x_n$			

Source: Authors

From Table 2, the rows showed the output distribution of goods in each sector. The columns showed the structure of output for each industry that determines what input is needed, such as raw materials which were a part of intermediate demand. Primary input consists of wages and salaries, operating surplus, which was the rent, interest, depreciation, and indirect taxes, minus subsidies. The imported goods were accounted for in the table. The input-output table showed the status of demand and supply of goods in an economic system, which was the general equilibrium of goods and services in the open economy. Therefore, the table showed that the relation of input was always equal to output. Business activities in the economy between inter-industrial transactions can be nearly explained in algebraic form as follows (Pisanwanich, 2008):

Each row showed the distribution of industrial output by assuming there are n sectors of output, that was:

$$\sum_{j=1}^{n} X_{ij} + F_i = X_i \qquad\qquad \forall i=1, 2, 3,..., n \qquad\qquad (1)$$

where X_{ij} = demand of industrial goods i for an output of industry j

X_i = the value of an output of industry i

F_i = final demand for industrial goods i

Similarly, each column showed a structure of the operating cost of output of industrial goods j, that was:

$$\sum_{i=1}^{n} X_{ij} + V_j = X_j \qquad\qquad \forall j=1, 2, 3,..., n \qquad\qquad (2)$$

where V_j = the added value of output sectors j

By assuming the use of input was in direct proportion to output value

$$X_{ij} = a_{ij} \cdot X_j \qquad\qquad\qquad\qquad\qquad (3)$$

or $$a_{ij} = \frac{X_{ij}}{X_j} \qquad\qquad\qquad\qquad\qquad (4)$$

Such as a_{ij} was being called input or Technical coefficients of each input used in industrial output i

From the relation (2) – (4) shown above, the matrix form can be explained as follows:

$$X = AX + F \qquad\qquad\qquad\qquad\qquad (5)$$

or $$X - AX = F \qquad\qquad\qquad\qquad\qquad (6)$$

$$(I-A)X = F \qquad\qquad\qquad\qquad\qquad (7)$$

$$X = (I-A)^{-1} F \qquad\qquad\qquad\qquad\qquad (8)$$

$$X = \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{bmatrix} \quad F = \begin{bmatrix} F_1 \\ F_2 \\ \vdots \\ F_n \end{bmatrix}$$

$$A = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix}$$

as   A= Coefficient matrix

I= Identity matrix

$(I-A)^{-1}$ = Inverse matrix, also called the Leontief Inverse Matrix, named after Prof.Wassily W. Leontief (1987), the founder of the theory of the input-output inverse matrix, which has become an important key in analyzing an economic system by I-O table.

Methodology

To create and analyze Thailand's sports input-output tables in soccer, futsal, and Thai boxing, the conceptual framework shown in Figure 4 is required.
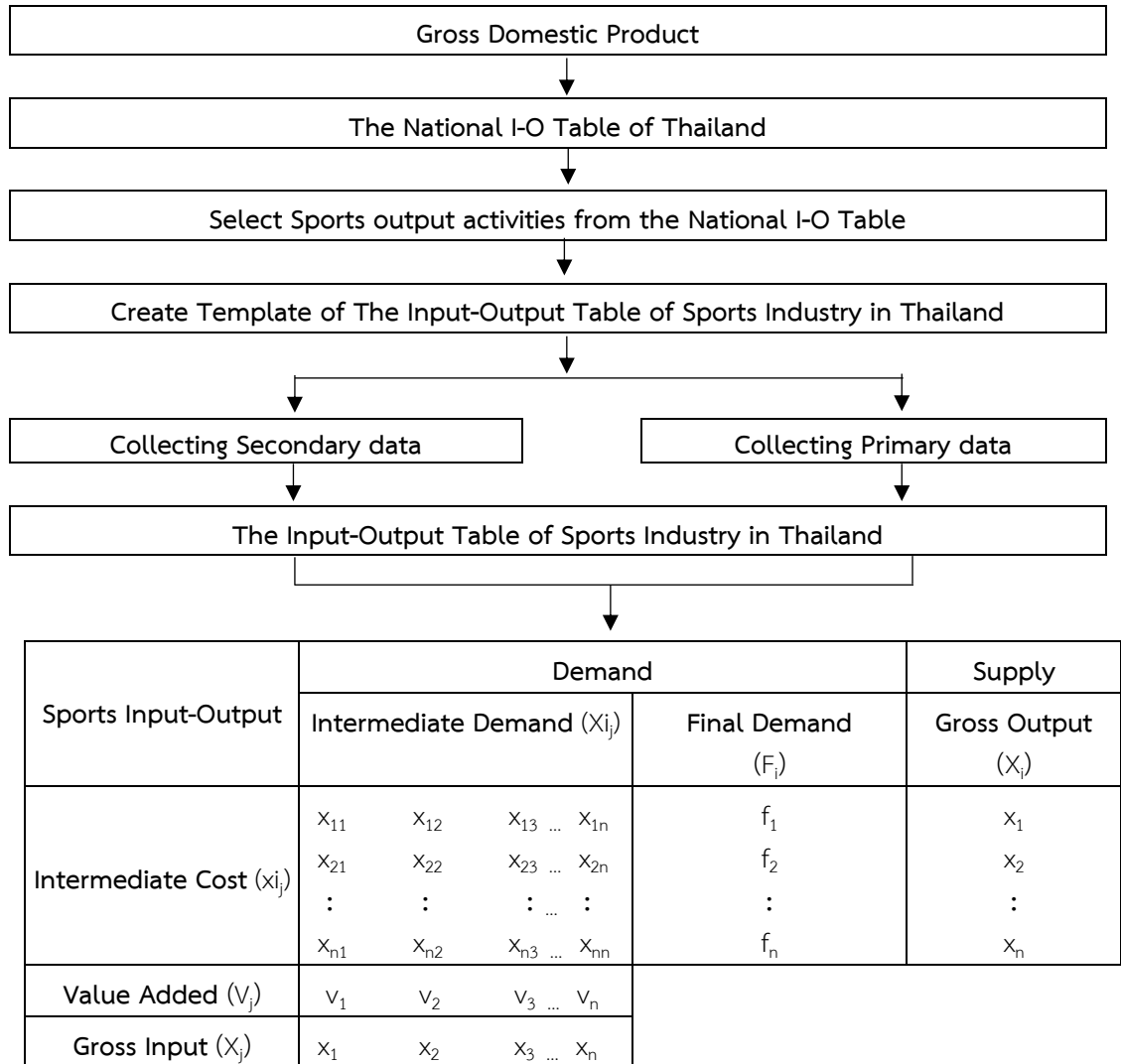
Gross Domestic Product

↓

The National I-O Table of Thailand

↓

Select Sports output activities from the National I-O Table

↓

Create Template of The Input-Output Table of Sports Industry in Thailand

↓

Collecting Secondary data	Collecting Primary data

↓

The Input-Output Table of Sports Industry in Thailand

↓

Sports Input-Output	Demand		Supply
	Intermediate Demand (X_{i_j})	Final Demand (F_i)	Gross Output (X_i)
Intermediate Cost (x_{i_j})	x_{11} x_{12} $x_{13} \ldots x_{1n}$ x_{21} x_{22} $x_{23} \ldots x_{2n}$ $\vdots$ $\vdots$ $\vdots \ldots \vdots$ x_{n1} x_{n2} $x_{n3} \ldots x_{nn}$	f_1 f_2 $\vdots$ f_n	x_1 x_2 $\vdots$ x_n
Value Added (V_j)	v_1 v_2 $v_3 \ldots v_n$		
Gross Input (X_j)	x_1 x_2 $x_3 \ldots x_n$		

Figure 4 Conceptual framework

Source: Authors

The creation and analysis procedure of the sports input-output table (Sports I-O Table) of Thailand mainly sports industry from Soccer, Futsal, and Thai boxing contains 9 steps as following:

1. Using the Gross Domestic Product (GDP) from the Office of the National Economic and Social Development Council (NESDC) in 2017, the national I-O table of Thailand was created; sized 180 x 180 sectors using an econometric method.

2. Selecting sports output activities from Thailand's I-O table. This study using 8 activities and 20 sports activities in Table 3.

Table 3 Thailand's I-O table and sports I-O table in Thailand

Thailand's I-O Table[1] (8 output activities)	Sports I-O Table[2] (20 sports output activities)
072 Wearing apparel	072-120 Manufacture of sports wearing
077 Footwear, except of rubber	077-600 Manufacture of sports footwear, except of rubber
133 Recreational and athletic equipment	133-250 Manufacture of soccer equipment
	133-260 Manufacture of futsal equipment
	133-270 Manufacture of Thai boxing equipment
145 Wholesale trade	145-310 Wholesale trade of soccer equipment
	145-320 Wholesale trade of futsal equipment
	145-330 Wholesale trade of Thai boxing equipment
146 Retail trade	146-310 Retail trade of soccer equipment
	146-320 Retail trade of futsal equipment
	146-330 Retail trade of Thai boxing equipment
167 Education	167-110 Public education institution (Sports School)
	167-120 Public education institution (General School but teaches sports in school)
	167-210 Private education institution (Sports School)
	167-220 Private education institution (General School but teach sports in school)
174 Radio, television, and related services	174-120 Sports radio
	174-220 Sports television
176 Amusement and recreation	176-902 Soccer club
	176-903 Futsal club
	176-310 ai boxing stadium

Source: [1] Office of the National Economic and Social Development Council

[2]Authors

3. Creating the template of the sports I-O table in Thailand; soccer, futsal, and Thai boxing.

4. Collecting data both of secondary and primary data in 2017.

4.1 Secondary data gathered information from the Department of Business Development, the Commerce Ministry. In 2017, the population's entrepreneurs accounted for 530,633 sports-related businesses.

4.2 Primary data gathered information from entrepreneurs who manufacture of sportswear, sports footwear, sports equipment, wholesale trade, retail trade, public education institutions, private education institutions, sports radio, television radio, soccer club, futsal club, and Thai boxing stadium.

Population: According to the Department of Business Development, the population accounted for 530,633 companies in 2017.

Sample Group: Yamane (1967)

$$n = \frac{N}{1+Ne^2}$$

Whereas   n = sample group

N = population

e = 0.05

$$n = \frac{530,633}{1+530,633 \, (0.05)^2}$$

n = 397.70 ≈400

This study used non-probability sampling and convenience sampling by data collecting from entrepreneur related to soccer, futsal, and Thai boxing, total 400 samples.
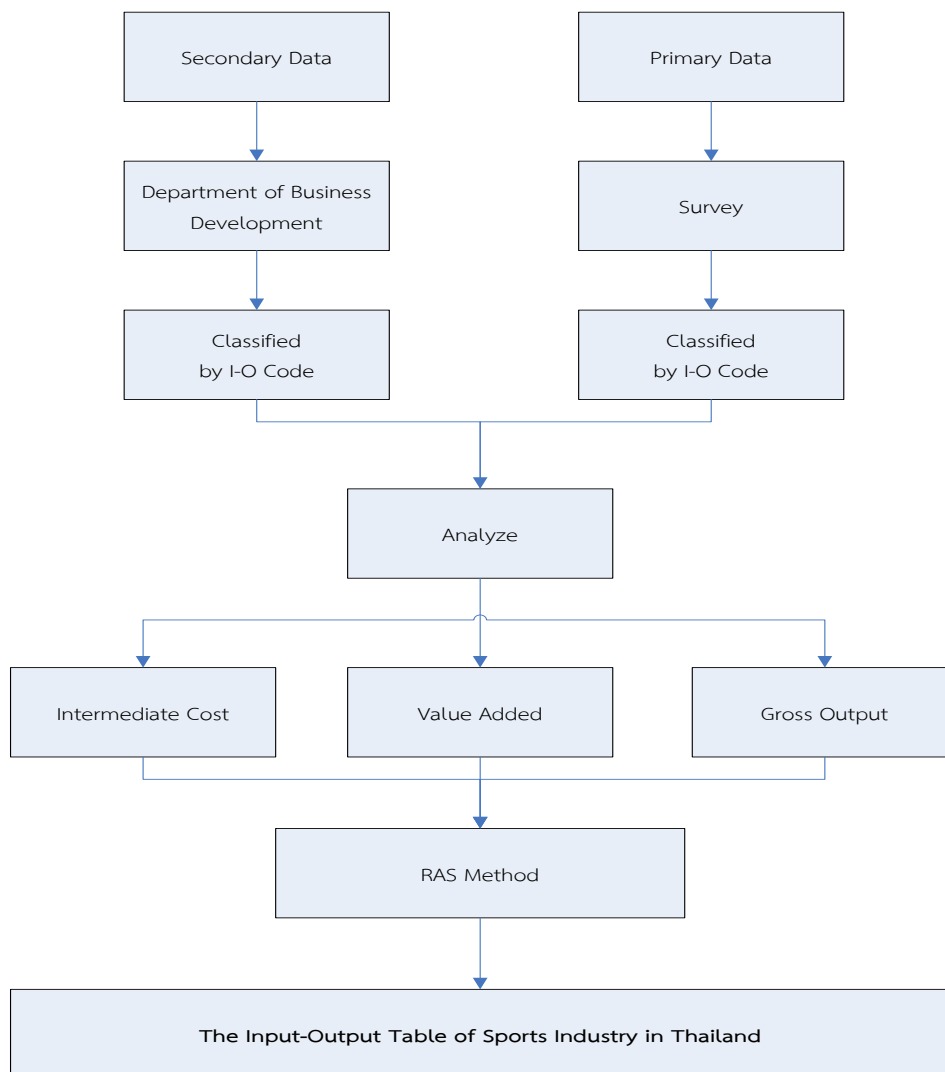
Figure 5 Data collecting, analyze and RAS method
Source: Authors

5. The information gathered from secondary and primary data can be classified into 20 sports activities to create the sports I-O table, which has a size of 200 x 200 sectors.

6. Analyze and calculate intermediate cost, value added, and gross output in the sports I-O table in Thailand.

7. Adjust the sports I-O table by the RAS method.

8. Checking the data accuracy by using the Leontief inverse matrix and allocational inverse matrix, which is the matrix that links Thailand's I-O table and gross domestic product together.

9. Finally, get the accuracy of the sports I-O table for the study.

Results

The sports I-O table in Thailand shown in Table 4 – Table 5 by the following:

Table 4 The economic value of the sports industry in Thailand; soccer, futsal, and Thai Boxing in 2017

(Unit: Million baht)

Transactions	Soccer		Futsal		Thai Boxing	
	Value	(%)	Value	(%)	Value	(%)
Intermediate Cost	65,410.45	32.04	45,953.67	38.85	60,858.75	48.11
Wages and salaries	52,195.11	25.56	25,793.71	21.81	22,849.61	18.06
Operating surplus	72,905.79	35.71	43,702.80	36.95	44,973.84	35.55
Depreciation	15,285.42	7.49	7,099.75	6.00	6,081.83	4.81
Indirect taxes less subsidies	-7,047.09	-3.45	-4,099.14	-3.47	-3,014.59	-2.38
Value Added	132,877.13	65.08	72,406.39	61.21	71,443.53	56.48
Gross Output	204,175.58	100.00	118,282.13	100.00	126,491.92	100.00

Source: Authors

In 2017, the gross output of soccer was approximately 204,175.58 million baht, futsal was approximately 118,282.13 million baht, and Thai boxing was approximately 126,491.92 million baht, according to Table 4. It mentioned gross output, soccer ranked first, followed by Thai boxing and futsal, respectively.

Table 5 Total sports industry, gross domestic product, and sports per GDP in 2017

(Unit: Million baht)

Transactions	Total Sports Industry[1]		Gross Domestic Product[2]		Sports per GDP (%)
	Value	(%)	Value	(%)	
Intermediate Cost	172,244.09	38.37	19,796,358.29	55.73	0.87
Wages and salaries	100,838.43	22.46	5,076,511.02	14.29	1.99
Operating surplus	161,561.18	35.99	6,500,455.01	18.30	2.49
Depreciation	28,467.00	6.34	2,622,751.02	7.38	1.09
Indirect taxes less subsidies	-14,160.82	-3.15	1,525,180.00	4.29	-0.93
Value Added	276,705.79	61.63	15,724,897.05	44.27	1.76
Gross Output	448,949.63	100.00	35,521,255.02	100.00	1.26

Source: [1] Authors

[2] Office of the National Economic and Social Development Council

According to table 5, the gross output of total sports industry in Thailand accounted for 448,949.63 million baht; including Intermediate cost accounted for 172,244.09 million baht or 38.37 percent and Value Added accounted for 276,705.79 million baht or 61.63 percent. Consideration the Sports Industry's Value Added accounted for 1.76 percent of the Gross Domestic Product in 2017.

Conclusion

The study aimed to create and analyze the sports I-O table in Thailand. The data used both of secondary data and primary data. Then, created a program to record data from both primary and secondary sources to calculate the coefficient of inputs in Soccer, Futsal, and Thai Boxing. Finally, the Template of Sports I-O table in Thailand was tested and improved inaccuracy.

Regarding the operation processing for the sports I-O table in Thailand, the same table size and definition in each field as the standard table of the Office of the National Economic and Social Development Council, size 180. x 180 sectors and adding 20 sports industry sectors. Consequently, the sports I-O table in Thailand at 200 x 200 sectors. The economic value of the sports industry can be summarized in Table 6.

Table 6 The economic value of the sports industry, GDP, and sports per GDP in 2017

Transactions	Total Sports Industry[1] (Million baht)	Gross Domestic Product (GDP)[2] (Million baht)	Sports per GDP (%)
Gross Output	448,949.63	35,521,255.02	1.26%
Intermediate Cost	172,244.09	19,796,358.29	0.87%
Wages and salaries	100,838.43	5,076,511.02	1.99%
Operating surplus	161,561.18	6,500,455.01	2.49%
Depreciation	28,467.00	2,622,751.02	1.09%
Indirect taxes less subsidies	-14,160.82	1,525,180.00	-0.93%
Value Added	276,705.79	15,724,897.05	1.76%

Source: [1] Authors

[2] Office of the National Economic and Social Development Council

According to the results in table 6, the gross output of Thailand's sports industry accounted for 1.26 percent of GDP, intermediate costs accounted for 0.87 percent of GDP, and value-added accounted for 1.76 percent of GDP. Moreover, this study found the "inter-industry linkages" and "multiplier effects" between the sports industry and other industries in the Thai economy, such as wearing apparel, footwear, recreational and athletic equipment, wholesale trade, retail trade, education, radio, television, amusement, and recreation. The conclusion confirms the sports industry is an important part of Thailand's economy.

Recommendations and Policy Implications

From the literature review, no studies have been found on the economic value of the sports industry in Thailand. This is Thailand's first direct research using an input-output table. This paper was a part of the research project "The Input-Output Table and Economic Impact of Sports Industry in Thailand" funded by Thailand Science Research and Innovation in 2018. Moreover, with the current research trends, there is not much research related to the sports industry. This study might be beneficial to academics and research.

Regarding, the complete I-O table must consist of 7 supporting matrices: 1) Purchaser's price table, 2) Wholesale trade margin table, 3) Retail trade margin table, 4) Transport cost table, 5) Producer's price table, 6) Import matrix table, and 7) Domestic value table, which can be used for a wide range of economic analysis. For this study, due to time and budget constraints, so the sports I-O table in this study has been created on the producer's price table and scope of the three sports: soccer, futsal, and Thai boxing. The results of this study showed just only the initial effects. However, to be more efficient, the sports I-O table in Thailand should be provided with imports matrix table dimensions.

As a result, to promote the economic value of the sports industry, the Ministry of Sports Department should support all activities related to the sports industry in Thailand, including the manufacture of sportswear, the manufacture of sports equipment, the wholesale trade of sports equipment, the retail trade of sports equipment, educational institutions both public and private, sports radio and television, and sports federations. According to the sports I-O table, was very use full for analysis to indicate policymakers to help facilitate improvements in the sports industry. Therefore, the next phase should study to cover all kinds of sports industry which play an important role in Thailand.

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