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About Editor(s)
Dr. Ágnes Csiszárik-Kocsir
Keleti Károly Faculty of Business and Management, University of Óbuda, Hungary
Email: kocsir.agnes@uni-obuda.hu

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Aims & Scope

In the 21st century, great changes are occurring in the management, economics and business in the world . During and after the covid-19 pandemic, new economic models, supply chains and monetary systems have been discussed. Traditionally, it is seen that change and transformation in the field of management, economics and business takes a little more time compared to fields such as health, technology and engineering. However, this situation seems to have started to change with the Covid-19 epidemic disease. It is expected that changes will occur in management, economics and business during and after the Covid 19 epidemic disease. For this reason, **this conference focused on** the changes and innovations in the field of manegement, economy and business that started with Covid 19. However, the organizing committee also recognizes the value of traditional knowledge in the management, economy and business. For this reason, the conference is also open to traditional studies in the field of management, economics and business.

The **aim of the conference** is to bring together researchers, business executives and administrators from different countries, and to discuss theoretical and practical issues in management, economics and business. At the same time, it is aimed to enable the conference participants to share the changes and developments in the field of management, economics and business with their colleagues.

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IConMEB 2021: International Conference on Management, Economics and Business

The Two-Dimensional Strip Cutting Problem: Improved Results on Real-World Instances

Mehdi MRAD
King Saud University

Tamer G. ALI
King Saud University

Ali BALMA
Ecole Nationale Sup´erieure d'Ing´enieurs de Tunis

Anis GHARBI
King Saud University

Ali SAMHAN
King Saud University

M.A. LOULY
Ecole Supérieure Polytechnique Mauritanie

Abstract: Cutting and packing problems arise in various industrial settings such as production of metal, glass sheets, papers, etc. The demand of items should be met while minimizing loss of waste material. One of the most known as a contemporary problem in field of operations research is the two-dimensional strip cutting problem. A set of m rectangular items is to be cut from a two-dimensional strip of width W and infinite height. Each item i ($i=1,2,\ldots,m$) has a width w_i, a height h_i, and a demand d_i. The objective is to determine how to cut the demanded items using the minimum height of strip and meet all the demands, while respecting the two stages of guillotine cuts. We address the arc-flow formulation for this NP-hard problem. A graph compression method is proposed and it is shown that substantially better results are achieved in obtaining optimal or near-optimal solutions of real-world instances.

Keywords: Integer programming, Arc-flow formulation, Strip cutting problem, Graph compression.

Introduction

The considered problem consists of a set of two dimensional items (square/rectangular) that are required to be cut from a raw material (strip). This NP-hard problem still attracts the researchers and motivate them to develop highly efficient algorithms to provide optimal/good solutions for both benchmark instances and real world problems. A set of factors might be considered by the researchers to solve the two-dimensional cutting problems, such as guillotine cut constraints, types of in-stock raw material, and the possibility of item rotation. According to Lodi et al. (1999), the two dimensional-cutting problems could be classified as follows:

- items could be rotated and guillotine cut is not considered (RF)
- items could not be rotated and guillotine cut is not considered (OF)
- items could be rotated and guillotine cut is considered (RG)

- items could not be rotated and guillotine cut is not considered (OG)

More classified and detailed typology of the cutting and packing problems is stated in Dyckhoff (1990) and Wäscher et al., (2007).

To solve the two-dimensional cutting problems either exactly or heuristically, a lot of approaches have been suggested in the literature. The reader is referred to the very interesting and recent papers of Delorme et al. (2016) and Iori et al. (2021) where all aspects of cutting and packing problems (variants, complexity, formulations, open problems) are presented.

Various methods have been proposed in the literature for the exact solution of cutting and packing problems, including branch-and-bound algorithms (Hifi 1998; Lodi and Monaci 2003; Mrad et al. 2013), arc-flow based formulations (Macedo et al. 2010), and one-cut formulation (Martinovic et al. 2018). The reason behind this diversity is the flexibility of adapting one formulation to fit many variants of cutting or packing problems. Among the exact methods related to the two-dimensional strip cutting problem, the arc-flow based mathematical formulation with pre-processing graph construction algorithm achieved a good results in case of the one-dimensional for bin packing problem (Brandão & Pedroso (2016)). The mentioned graph construction algorithm can reduce the initial size of a graph corresponded to the two-dimensional strip cutting problem. Therefore, we presents here the impact of using arc-flow formulation with compressed graph to solve forty-three real world instances from the literature (Macedo et al. (2010)). In the remaining of this paper, we present the arc-flow mathematical model in section II. The graph compression steps are described in section III together with an illustrative example. The computational results are presented in section IV.

Proposed Methodology

The arc flow formulation of the two-dimensional strip cutting problem

Consider a two-dimensional strip of width W and infinite height, and a set of m rectangular items. Each item i ($i=1,2,\ldots,m$) has a width w_i, a height h_i, and a demand d_i. The objective is to determine how to cut the demanded items using the minimum height of strip and meet all the demands, while respecting the two stages of guillotine cuts. In guillotine cuts, the first stage is to cut strip vertically to produce levels $\pi_k, k \in \{1, \ldots, n\}$, as shown in figure 1. While in the second stage, each level from stage 1 is cut horizontally to produce the demanded items as shown in Figure 2.

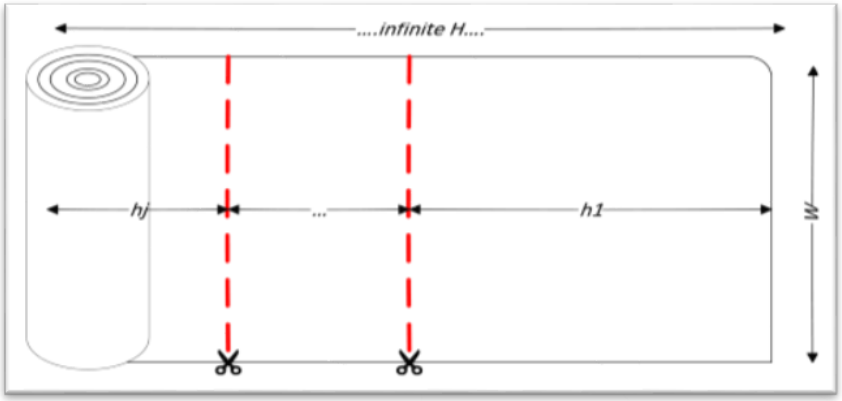

Figure 1. First stage of guillotine cut

The problem can be formulated using an arc-flow network as follows. A graph $G_k = (V_k, A_k)$ is built for each level $\pi_k, k \in \{1, \ldots, n\}$, where $V_k = \{0, \ldots, W\}$ is the set of vertices. Each level of type k has height h_k and can be composed only by items from set $S_k = \{i | w_i \leqslant h_k\}$. The set of arcs is $A_k = \{(i, j): 0 \leqslant i < j \leqslant W \text{ and } j - i = w_t \; \forall t \in S_k \text{ or } j - i = 1\}$. Interestingly, the following rules prevent the occurrence of symmetric paths in any graph corresponding to any cutting pattern:

- The items are ordered in decreasing order of their widths.
- On each shelf, any path must include an item with the same height as the shelf.
- The number of occurrences of an item in a path cannot exceed its own demand.

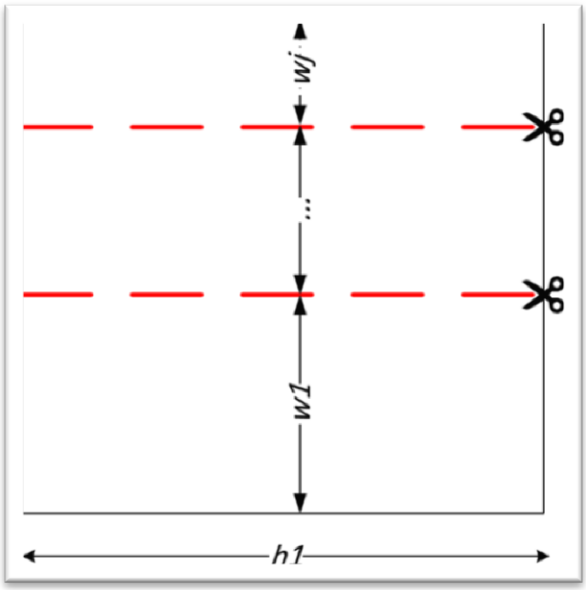

Figure 2. Second stage of guillotine cut

For the sake of clarity, let us consider the following illustrative example. A set of four items has to be cut from a strip with width W = 11. The items' data are provided in Table 1. In the first cutting stage, we obtain four shelves with dimensions (9, 11), (7, 11), (6, 11) and (4, 11). In the second stage, each shelf is represented by a graph as shown in figure 3 (note that most of the dotted arcs have been removed for the sake of clearness).

Table 1. Data of the illustrative example

Item	Height (h_i)	Width (w_i)	Demand (d_i)
I_1	9	7	1
I_2	7	6	1
I_3	6	6	1
I_4	4	4	1

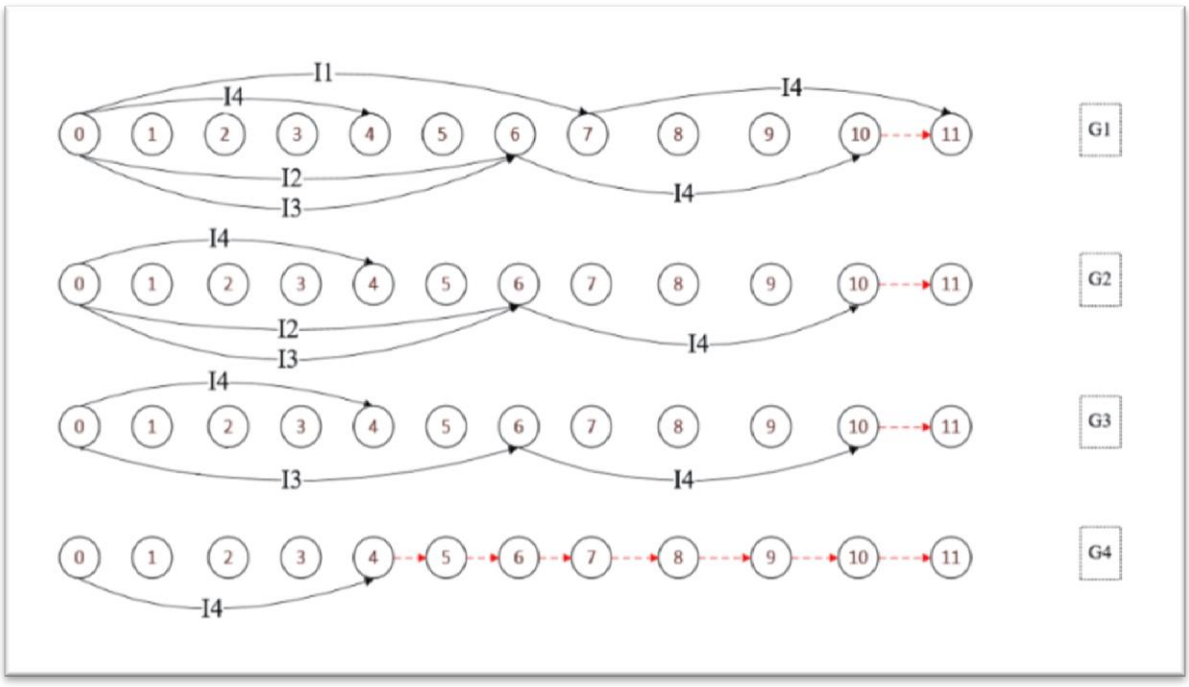

Figure 3. Arc-flow network of the illustrative example

After generating all the graphs, the addressed problem is formulated by the following mathematical model:

- Decision variables:

$\boldsymbol{x_{abh}^k}$: an integer variable associated with each arc (a,b) of A_k that takes the number of items of width $(b - a)$ and height $h \in H_k$ ($H_k$is the set of different item heights in S_k) placed at position a from the beginning of a shelf k. This variable represents the flow of the arc (a, b) associated with the item of height h in the graph G_k.
$\boldsymbol{z_k}$: the total flow of the graph corresponding to π_k.

- The objective function:

$$Min \sum_{k=1}^{n} h_k z_k \quad (1)$$

Subject to:

$$\sum_{(a,b)\in A^k, h\in H_k} x_{abh}^k - \sum_{(b,c)\in A^k, h\in H_k} x_{bch}^k = \begin{cases} z_k \ if \ b = 0 \\ 0 \ if \ b = 1, \dots, W-1 \\ -z_k \ if \ b = W \end{cases}, k = 1, .., n \quad (2)$$

$$\sum_{k, h_k \geq h_j} \sum_{(a, a+w_i)\in A^k} x_{a,a+w_j,h_j}^k \geq d_j, \forall j \in \{1, \dots, n\} \quad (3)$$

$$x_{abh}^k \geq 0 \ and \ integer, \forall (a,b) \in A_k, \forall h \in H_k, \forall k \in \{1, \dots, n\} \quad (4)$$

$$z_k \geq 0, \forall k \in \{1, \dots, n\} \quad (5)$$

In objective function (1), we minimize the total used height from strip. The flow conservation is balanced in (2), where the entering flow is equal to the leaving flow for each node. In (3) the total number of cut items for each item should be larger than or equal to its demand $d_j \ \forall j \in \{1, \dots, n\}$. Equations (4) and (5) identify the domain of variables.

The Compressed Graph

The graph compression plays an important role in reducing the number of nodes/arcs of the initial graphs (Brandão and Pedroso 2016). Using compressed graphs helps in constructing a smaller model size in terms of number of variables, which in turns has an impact on the solution time.

Step 1 Level Graph

Consider the following example where the width of the strip is equal to 10. Three items are to be cut with widths 8, 6 and 4, respectively. The initial graph has a total of 6 arcs and 5 nodes (see figure 4). In the level graph, each node *u* has two labels. The first one is *x(u)* which denotes the position of the node. The second one is *l(u)* which denotes the item of the node. The level graph of our example is displayed in Figure 5.

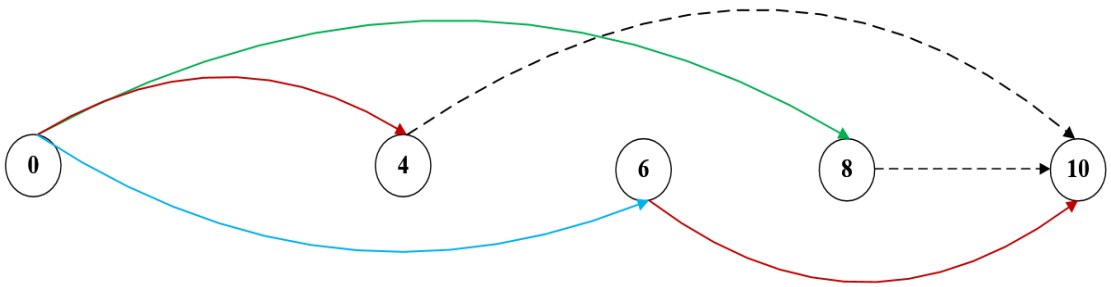

Figure 4. The initial graph

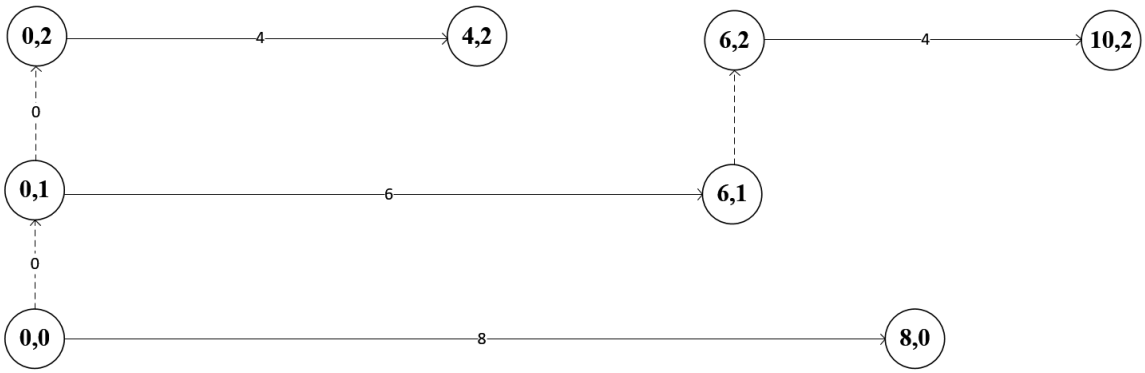

Figure 5. The level graph

Step 2 Reduced graph

In this step, we apply a reversed topological sorting to the set of arcs belonging to the level graph. Let set *A* contain all nodes of level graph and sorted in topological order reversely. The topological order is a linear ordering of vertices such that for every directed edge (*u*,*v*), node *u* comes before *v* in the ordering. Finally, each node *u* belongs to the set sorting is labeled $\emptyset^d(u)$ based on equation (6). The resulting final compressed graph of G1 is shown in Figure 6.

$$\emptyset(u) = \begin{cases} 0 & if\ u = S, \\ W & if\ u = T, \\ min_{(u',v,i)\in A:u'=u}\{\emptyset(v) - w_i\} & otherwise \end{cases} \quad (6)$$

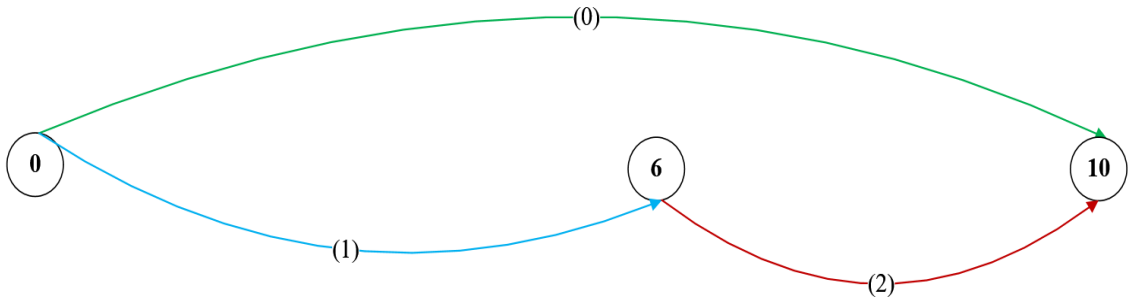

Figure 6. The compressed graph

Results and Discussion

To evaluate the performance of the compressed arc-flow mathematical model, the method was coded in CPLEX IMB ILOG software version 12.6 and run on a PC with Windows10 operating system, 32 GB RAM and intel i7 CPU 3.4 GHz processor. The experiments were conducted on a set of 43 real-world instances A1-A43 used by Macedo et al. (2010).

Tables 2 and 3 depict the results of the arc-flow model without and with compressed graph, respectively. In these tables, we display for each instance:

- *D*: the total number of items demands
- *Optimal*: the optimal value of the objective function
- *Number of arcs*: the number of arcs before/after graph compression and the reduction percentage of the graph size
- *Computation time*: the required time to find the optimal solution before/after compression and the ratio of the former over the latter

Table 2. Results of the arc-flow formulation without graph compression

Instance	D	Optimal	Number of arcs	Computation Time
A1	24	3678	9	0.04
A2	38	32380	11	0.01
A3	17	7986	4	-
A4	16	3044	22	-
A5	138	24870	451	1.00
A6	17	1860	10	0.01
A7	58	14039	43	0.05
A8	16	1240	6	-
A9	770	125823	28718	3.19
A10	44	4815	31	0.01
A11	724	94873	12867	2329.35
A12	44	26928	16	0.01
A13	304	27550	1104	3.08
A14	809	139959	18684	14.20
A15	339	80646	336	0.69
A16	744	172244	7969	0.55
A17	135	9902	102	0.04
A18	559	134003	5802	0.50
A19	507	119006	6550	0.12
A20	215	53181	534	0.02
A21	450	57348	3052	0.80
A22	24	5005	6	-
A23	248	27365	916	0.43
A24	217	72231	49209	4.62
A25	156	36591	50050	32.98
A26	61	14791	4107	0.10
A27	180	40438	109583	543.12
A28	106	23529	30664	2.79

A29	218	57364	66787	5.31
A30	39	7743	3357	0.12
A31	64	16175	3230	5.22
A32	184	56264	48971	1.77
A33	309	72981	123658	159.24
A34	46	11142	1238	0.35
A35	144	34554	18114	18.92
A36	52	14738	808	0.07
A37	78	9743	200	0.04
A38	160	46057	3006	0.29
A39	22	6355	196	0.02
A40	163	20510	3736	54.07
A41	71	22522	4426	0.11
A42	13	6953	37	0.01
A43	22	7568	119	0.02

Table 3. Results of the arc-flow formulation with graph compression

Instance	**D**	**Optimal**	**Number of arcs**	**Computation Time**
A1	24	3678	7	0.02
A2	38	32380	7	0.01
A3	17	7986	2	-
A4	16	3044	10	-
A5	138	24870	143	0.56
A6	17	1860	5	0.01
A7	58	14039	30	0.01
A8	16	1240	5	-
A9	770	125823	5604	1.08
A10	44	4815	17	0.01
A11	724	94873	2378	22.63
A12	44	26928	11	0.01
A13	304	27550	163	0.38

A14	809	139959	3537	3.79
A15	339	80646	113	0.29
A16	744	172244	1485	0.53
A17	135	9902	43	0.04
A18	559	134003	988	0.77
A19	507	119006	1487	0.05
A20	215	53181	149	0.02
A21	450	57348	709	0.93
A22	24	5005	5	-
A23	248	27365	234	0.35
A24	217	72231	15066	5.09
A25	156	36591	12362	10.99
A26	61	14791	979	0.10
A27	180	40438	25366	1682.88
A28	106	23529	6111	0.84
A29	218	57364	13814	0.89
A30	39	7743	807	0.10
A31	64	16175	803	4.42
A32	184	56264	11690	0.66
A33	309	72981	44162	17.48
A34	46	11142	357	1.26
A35	144	34554	5091	17.49
A36	52	14738	205	0.07
A37	78	9743	82	0.04
A38	160	46057	827	0.56
A39	22	6355	68	0.01
A40	163	20510	1726	96.10
A41	71	22522	858	0.07
A42	13	6953	18	0.01
A43	22	7568	48	0.02

The obtained results provide strong evidence of the positive impact of the graph compression in terms of graph size and computation time. Indeed, the number of arcs of the generated graph is reduced, on average, by 63.89% after using the proposed graph compression technique. This size reduction exceeds 80% in many of the considered instances. Moreover, the required computation time of the uncompressed version is about 4.61 times that of the compressed one.

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Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the authors.

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Author Information	
Mehdi MRAD King Saud University Riyadh, Saudi Arabia	**Tamer G. ALI** King Saud University Riyadh, Saudi Arabia
Ali BALMA Ecole Nationale Supérieure d'Ingénieurs de Tunis Université de Tunis Tunis, Tunisia	**Anis GHARBI** King Saud University Riyadh, Saudi Arabia Contact e-mail: *a.gharbi@ksu.edu.sa*
Ali SAMHAN King Saud University Riyadh, Saudi Arabia	**M. A. LOULY** Ecole Supérieure Polytechnique Mauritanie Mauritanie

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Determining Consumers' Expenditure Types in Tourism Marketing: Turkey Example

Mualla AKCADAG
Sivas Cumhuriyet University

Tuba BOZKURT
Sivas Cumhuriyet University

Abstract: Many factors such as globalization, the increase in demand in health tourism, the development of welfare, the need for social interaction, the increase in entertainment opportunities, the desire for cultural development of people, the increase in faith-related trips provide the development of tourism marketing. Therefore, it is inevitable for businesses performing marketing activities in the tourism sector to develop new steps and strategies in order to compete sustainably. From this point of view, with this study, it is aimed to examine the most common expenditure types of consumers by making use Turkey 2020 TUIK data. When the data obtained from TUIK is examined, it is understood that personal expenditures are mostly made in tourism, followed by food-beverage and accommodation type expenditures. The lowest expenditure type in Turkey tourism in 2020 is tour services. With this study, it is thought that by examining the expenditure types of tourism consumers, it will help the businesses in the sector in terms of marketing activities and in determining the strategies in the tourism sector.

Keywords: Marketing, Tourism marketing, Consumers' expenditure types.

Introduction

In the global environment, marketing activities which constitute one of the most important rings of business activities, are of key importance in terms of achieving sustainable competition in tourism, and it is one of the rapidly developing sectors. Businesses that are rapidly developing in the tourism sector develop strategies to compete and concentrate on keeping the satisfaction of their target audience and consumers. Businesses in the tourism sector, which are included in service marketing, will have a positive impact on their target audiences by keeping up with the constantly changing market conditions. Considering the marketing mix elements (4P, 7P, 7C) while developing strategies. From this viewpoint, it is aimed to benefit both businesses and relevant stakeholders by examining consumer expenditures in the tourism sector. It is believed that examining the data obtained from TUIK in the tourism sector in 2020, determining the most and the very expensive item among consumers' expenditure types and it will contribute to the literature by providing information to interested parties on this subject.

Literature Review

When the studies on the tourism sector are examined, it is seen that the majority of the studies focus on consumer behaviors. (Asanbekova, 2007;İlban vd. 2011; Acar, 2019;Ünal, 2019; Erol, 2020). It is possible to divide the studies examining consumer behavior in the tourism sector into two groups as theoretical and applied. In theoretical studies, the concepts of consumer, consumer behavior and tourist consumer, tourist types, factors affecting consumer behavior have been examined. In applied studies, it is aimed to determine the dimensions that tourists expect before their purchasing behavior and that form their opinions in the next process. And measuring the differences between dimensions, determining the factors affecting consumer purchasing behavior in tourism, determining the profile of domestic and foreign tourists are discussed.

Some of the other studies on this topic are to determine the situations that affect the tourism sector revenues, which is a constantly developing sector in Turkey and whose revenues are used to finance the foreign trade deficit, also focused on guerrilla marketing, social marketing, entrepreneurial marketing, and content marketing (Harbalıoğlu, 2013; Çokal & Büyükkuru, 2018). In the studies, (VAR Analysis and Granger causality analysis) were used and the relationship between tourism revenues and the number of tourists in Turkey was explained as a bilateral causality relationship. And the applicability of marketing types in the tourism sector, new marketing methods, the applied examples of new marketing methods in other countries that can be applicable in Turkey have been mentioned.

The remaining studies on this topic are related to the use of technology in tourism. Analysis of online reviews of businesses operating in the tourism sector through TripAdvisor application, how Hotel businesses use marketing activities on Facebook and Instagram social media platforms and what kind of information they provide on these platforms, Issues such as determining the factors affecting the intention of domestic tourists to create online hotel reservations and the frequency of making reservations are discussed. (Kocaman, 2018; Yazıcı-Ayyıldız, 2020; Curkan & Köroğlu, 2020).

In the literature review, many theoretical and applied studies on tourism marketing were found. The closest to this study is the research that examines package tour expenses in tourism marketing (Hoşcan and Selçuk, 2021). However, since there has not been a recent study on the determination of all types of expenditures in the tourism sector. In this sense, it is aimed to fill the gap in the literature.

Conceptual Framework

Tourism marketing can be described as the activities of determining the places to visit, accommodation, pricing, deciding on the promotional components, and distribution in order to meet the needs of a country's domestic and foreign tourists. Expenditure types of consumers in tourism marketing; can be classified into two categories as personal expenses and package tour expenses. The types of expenditures included in this classification are discussed below.

Personal Expenses: In terms of consumer expenditure type items, personal expenditures in tourism marketing have the largest share in the country's tourism economy. All expenditures of tourism consumers other than package tours are called personal expenditures. This item type includes the products such as food and beverage, accommodation, health, transportation, sports, education, culture, tour services, international transportation, mobile phone roaming services, clothing and shoes, souvenirs, carpets, rugs, other goods and services.

Package Tour Expenses: Package tours, which became widespread and important after the Second World War, make an inevitable contribution to the country's economy (Hoşcan and Selçuk, 2021). It is possible to characterize the package tour expenses and the fees paid to the package tour performed by tour companies within the tourism services are sold directly or indirectly (agent). Package tour expenses include many services such as transportation, food, and beverage, guidance services, entertainment, health, The pilgrim visits. The sale of all these services is also called package tour expenses (Budeanu, 2005). Therefore, it is thought that this study will contribute to the literature in terms of determining the expenditure types of consumers in tourism marketing, revealing the highest expenditure item in 2020, and presenting information to the businesses sector.

Research Method and Sampling

The research aims to examine the most expenditure types and to create resources for those concerned in the sector by reviewing the types of expenditures in tourism marketing in Turkey 2020. In research on tourism, TUIK data is regularly collected every three months. The sample of the research is determined by TUIK. It consists of foreigners and citizens over the age of 14 residing abroad who visit Turkey for a day or overnight stay.

A face-to-face interview method is applied every four months to foreigners and citizens who enter and leave the border gates (22 border gates) determined by TUIK. EGM (General Directorate of Security) passport records every three months data sources were created by TUIK. In addition, the data is processed by the Ministry of Culture and Tourism. In this sense, by examining the data obtained from TUIK, the number and change of visitors to Turkey in 2020, the countries of the visitors to Turkey, the mode of transportation used by the visitors to arrive in the country, the average tourism expenditure, and the types of expenditures in the Turkish tourism sector, frequency, percentage distribution, and tables will be analyzed in detail.

Findings

By examining TUIK 2020 data, the number and change of visitors coming to Turkey, the countries from which visitors come to Turkey (5 countries), The mode of transportation used by visitors coming to Turkey, Turkey average tourism expenditure (USD), Turkey tourism types of expenditures are indicated in the tables below.

Table 1. Number and change of visitors coming to Turkey in 2020

Visitors	Number of Visitors	Change
Foreign Visitor	12 734 213	71,74 %
Foreign Resident Citizen	3 236 988	51,61 %
Total	15 971 201	69,14 %

Source: Türkiye İstatistik Kurumu (TUİK), Merkez Bankası, Kültür ve Turizm Bakanlığı, 2020.

The number of visitors coming to Turkey in 2020 was 15 971 201 in total, with a decrease of 69.14% compared to 2019. While a decrease of 71.74% was observed in foreign visitors, there was a decrease of 51.61% in the number of citizens residing abroad who came to Turkey. It is stated that the decrease in the number of visitors to Turkey in 2020 compared to 2019 is due to restrictions within the scope of Covid19 (TÜRSAB Report, 2020). The following table shows the information about the country of residence of citizens and foreign tourists who arrived in Turkey in 2020.

Table 1. Countries from which visitors come to Turkey in 2020 (5 countries)

Rank	Country	Number (Person)
1	Russia	2 128 758
2	Bulgaria	1 242 961
3	Germany	1 118 932
4	Ukraine	997 652
5	England	820 709

Source: Türkiye İstatistik Kurumu (TUİK), Merkez Bankası, Kültür ve Turizm Bakanlığı, 2020.

Most of the visitors coming to Turkey in 2020 are from Russia (2 128 758). Russia, Bulgaria, Germany, Ukraine, and England are the top 5 countries. Tourists from these countries make many contributions to the country's tourism economy. In this sense, it will be beneficial for tourism enterprises to determine these five countries as target countries and to determine all marketing activities (product, price, distribution, promotion) according to the citizens of this country.

Table 3. Contains information about the mode of transportation used by the tourists coming to Turkey.

Rank	Type of Transportation	Percentage
1	Airline	75,23 %
2	Highway	23,31 %
3	Seaway	1,95 %

Source: Türkiye İstatistik Kurumu (TUİK), Merkez Bankası, Kültür ve Turizm Bakanlığı, 2020.

Due to its location, visits are made to Turkey using almost all modes of transportation. Tourists coming for tourism purposes mostly (75.23%) prefer airlines transportation modes. Seaway is the least preferred mode. In this sense, it is necessary to give more importance to railway passenger transportation due to many reasons such as low energy use, less space usage, and the least number of accidents. The information that tourism expenditures, which are inevitable to have a positive effect on the country's economies, are grouped as foreigners and citizens residing abroad, discussed in Table 4.

Table 4. 2020 Turkey average tourism expenditure (USD)

Average Tourism Expenditure per Capita	762 $
Foreigners	716 $
Citizens Residing Abroad	926 $

Source: Türkiye İstatistik Kurumu (TUİK), Merkez Bankası, Kültür ve Turizm Bakanlığı, 2020.

When we look at the average tourism expenditures of the visitors coming to Turkey for tourism purposes, it is understood that the citizens residing abroad spend an average of 926 dollars, while the foreigners spend an average of 716 dollars. In this sense, more and different product/service diversity, innovation and promotion components in price strategies can be improved so that foreign tourists can spend more. Among the promotional components, the country's tourism and market can be promoted by focusing on advertisements abroad. The table regarding the analysis of Turkey's tourism expenditure types in 2020 which is the main purpose of the study is as follows.

Table 5. Types of tourism expenditures in Turkey in 2020

Expenditure Type	2020	(%)
Total Tourism Expense	12 059 320	100,0
Personal Expenditures	9 998 320	82,9
Food and beverage	2 815 772	23,3
Accomodation	1 255 681	10,4
Health	548 882	4,6
Transportation	827 384	6,9
Sports, Education, Culture	104 716	0,9
Tour Services	30 744	0,3
Domestic International Transport	1 882 315	15,6
Cell Phone Roaming Expenditures	47 414	0,4
Marina Service Expenditures	27 929	0,2
Other Goods and Services	2 457 483	20,04
Clothing And Shoes	1 540 506	12,8
Souvenir	480 515	4,0
Carpet And Rug Etc.	25 220	0,2
Other Expenditures	411 241	3,4
Package Tour Expenses	2 060 999	17,1

Source: Türkiye İstatistik Kurumu (TUİK), Merkez Bankası, Kültür ve Turizm Bakanlığı, 2020.

TUIK classifies the types of expenditures for analysing tourism expenditure types in two categories as personal expenditures and package tour expenditures. Total tourism expenditure in 2020 was 12 059 320 TL. It is seen that the most personal expenditures (9 998 320 TL) are made among the expenditure types. Package tour expenses is 2 060 999 TL.

In personal expenditures, while the most expenditure was made in food and beverage items, the percentage change in this item compared to 2019 was 23.3%. The richness of our country's food and beverage culture has shown itself in this type of expenditure. The richness of its unique cuisine in almost every part of Turkey attracts the attention of

tourists from abroad. The tourism sector is an inevitable platform in promoting the richness of the food and beverage culture to the whole world. In this sense, businesses in the tourism sector should constantly review their activities related to this type of expenditure and regulate their marketing activities in order to achieve sustainable competition. The second type of expenditure, which has the largest share in personal expenditures, is other goods and services. This type of item is personal expenses excluding food and beverage, accommodation, health, transportation, sports, education, culture, tour services, mobile phone expenses, marina service expenses, clothing and shoes, souvenirs, carpets and rugs. This item includes many services such as banking transactions, cosmetics and hairdressing services. These data reveal the importance of the sectors in which such expenditures occur in tourism.

It is understood that the items with the lowest personal expenditures are carpets and rugs (25,220 TL), marina service expenditures (27,929) and the lastly tour services. Increasing the importance of carpet and rug weaving, which are local products in the past, and promoting these products in international markets can prevent the decrease in such expenditure items. There are many local products in Turkey like (carpet, rug, cutlery, calligraphy, marbling art, copper making, Malatya apricot, Kayseri preserve of dried meat) It is obvious that these products, whose quality is indisputable, are known not only in Turkey but also all over the world. Which will lead to positive changes in the spending types of tourists.

Among the reasons for the low cost of marina services, there may be the problems of maritime operators in Turkey, which are the subject of many articles (Tutar et al., 2009; Ateş ve Işık, 2010; Göktaş, 2019). Solving the problems experienced in maritime logistics and marina services may cause such expenditures to increase. Another item that is low in personal expenditures is sports, education and cultural services. In Turkey, which has many ancestral sports (jereed, archery, oil wrestling, equestrian), it is necessary to give importance to these kinds of sports and to attract the attention of tourists in the field of sports by organizing tournaments and events in other sports branches. Each item in tourism expenditure types has a value for the country's economy. The sectors to which these expenditure types belong need to determine their marketing activities well in order to gain both new customers and make existing customers loyal.

Conclusion and Recommendations

The aim of the study is to examine the 2020 Tourism expenditure types in the light of the data obtained from TUIK and to provide information to the businesses and interested parties in the sector. According to the TUIK data, it has been understood that the most individual expenditure is made among the types of tourism expenditures in 2020. It is also seen that there is an increase of 17% in tour expenses and the importance of which is increasing day by day. The highest increase was observed in the food and beverage item among the individual expenditures. The lowest expenditure in individual expenditures was in the carpet rug item. In this sense, businesses in the tourism sector need to take precautions and bring innovations in the marketing activities of local products, sports, education and culture, marina services and tour services, which include individual expenditures.

Among the findings of the study, it is understood that people living in Russia, Bulgaria, Germany, Ukraine and England mostly prefer Turkey. Businesses in the tourism sector should examine five countries as target countries and determine all their marketing activities according to the citizens of these countries. Yet another finding is that, among the transportation modes, the airline is the most used mode. But the railroad which need less energy, less space usage, and less number of accidents, didn't prefer. For these reasons, it is necessary to give more importance to rail passenger transportation in travels for tourism purposes. Again, in order to increase the tourism expenditure income, improvements can be made in different product/service diversity, innovation and promotion components in price strategies so that foreign tourists can spend more. Among the promotional components, the country's tourism and products should be promoted, with particular emphasis on advertisements abroad.

Comparing the study with the studies in the literature makes it difficult because there are very few studies on this subject, but it is thought to be important because it fills the gap in the literature. In the study conducted by Hoşcan and Selçuk (2021), the importance and increase of tour package expenditures were mentioned. While the same study has similarities in terms of examining tour expenditures in the light of data obtained from TUIK, it differs in terms of examining all tourism expenditure types in this study.

When it comes to the limitations of the study, the data is obtained only from TUIK site. However, it can be recommended to develop scales related to the subject in future studies. One value constraint is to examine only the 2020 data. Apart from this period, when the Covid19 process is experienced in uncertainties, the last 10 years can be examined. In addition, in future studies, Turkey and other countries can be compared in terms of tourism expenditures. With this study, it is thought that by shedding light on the spending types of 2020 Turkey Tourism, it will be beneficial to the businesses and interested parties in the sector.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the authors.

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Author Information

Mualla AKCADAG
Sivas Cumhuriyet University, Faculty of Economics and Administrative Sciences, Department of International Trade and Logistics, Sivas, Turkey
Email: makcadag@cumhuriyet.edu.tr
Orcid: 0000-0002-0785-3976.

Tuba BOZKURT
Sivas Cumhuriyet University, Social Sciences Institute, International Trade and Logistics. Doctoral Program, Sivas, Turkey
Orcid: 0000-0001-9576-5599.

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Opportunities and Problems Offered to Software Companies by the Pandemic Process

Tayfun ACARER
Istanbul Bilgi University

Abstract: The pandemic process is an event that we have never encountered in our lives, and it still continues as a reality that we do not know exactly when it will end. In fact, this problem experienced by individuals is also valid for all businesses. The pandemic continues to affect all sectors. Software is also one of the sectors affected by the pandemic. Although this influence has positive aspects, it also has serious negative aspects. Especially in this process, online working, information security, video conferencing systems, online education etc. While many new job opportunities have been provided for the software industry with many applications, a very significant need for experienced and qualified software developers has emerged. Especially the need for experienced software developers who can work independently and develop software has reached its peak in this process. These developments are seen in many countries in the world as well as in Turkey. Currently, the positive and negative effects of the pandemic on the software industry are felt much more aggressively in developed countries. As a result of this, there have been very serious transfers of experienced software developers to developed countries, especially in recent years.

Keywords: Pandemic, Software Companies, Software Engineers

Introduction

Pandemic is an epidemic disease that we have not encountered before. It has caused serious astonishment and uncertainty not only in our country, but also in all countries, both individually and institutionally. This epidemic, whose conclusion date is still unknown to anyone, has had very important reflections on the activities of both individuals and businesses. While these reflections have positive aspects, they also have many negative consequences.

The software industry, which constitutes the most important part of informatics, has also been one of the business lines most affected by these reflections. In particular, the informatics sector, which is named after our age, is the locomotive of economies today. Indeed, many countries that have made good use of the developments in this sector (Acarer, 2017), which has become an integral part of our lives and have become an integral part of our lives in recent years, have provided very positive developments in their general economies. Ireland, India, Iceland, Russia etc. Some countries, on the other hand, focused only on the software part of informatics and provided very important employment rates and economic income with very small investments. It is possible to observe many examples of these in the last fifteen years. Because of all the developments in the Informatics Sector also affect all other sectors that are under the influence of the sector (Tekin et al., 2000). The fact that the IT sector is dependent on technology and that this technology tends to develop continuously (Özdemir, 2009) is a very important factor.

The information sector, which is named after the century we are in; It is an important production tool in the activities of companies in terms of efficiency and competition. (Özgün, 2015). As a result of this, if the enterprises make maximum use of the developments in the information sector, which is very closely related to

their own activities, they will gain very important advantages in the competition they will make. Otherwise, it is almost impossible for companies that cannot benefit from and keep up with the developments in this sector to continue their activities (Kılınç & Ünal, 2019).

The most important reflections of this sector, which is defined as ICT (Information Communication Technology) in the international literature, are still seen in Big Data (Big Data) and Artificial Intelligence (Artificial Intelligence), which processes and makes sense of this data. It is only possible to get the desired result in these two areas and to transform it into an economic model, only by employing sufficient number and quality of software developers.

Developments in the IT Sector

The IT sector, as a high-tech sector, is gradually increasing its market share in Turkey and is becoming an industry where domestic investments are increasing (Bilir et al., 2017). The mobile communication infrastructure of informatics, which emerged for the first time in the early 1980s, has started to develop rapidly since this date. The first generation mobile communication systems (1G), which were analog, were known as car phones. These devices, which are quite large, draw serious energy, so they can be used in cars, buses, etc. Apart from mobile devices, its practical use has not been possible. Afterwards, a new generation of mobile communication emerged every 10 years. Narrowband data service was started to be used for the first time with the second generation systems (2G). In 2G, the data rate was also quite low, since the bandwidth was low.

It has started to be used as broadband mobile communication systems with the third generation mobile communication systems (3G). With the communication opportunity provided by broadband, "applications" have started to find application areas intensively and the transmission of services that require large bandwidth such as video communication, video, picture has become possible. With the fourth generation systems (4G), Internet Protocol (IP) has been used in mobile communication and the infrastructure has turned into a very different technology compared to previous generations. The IP infrastructure has also been the beginning of the change in the architectural structure of the mobile communication system. The transformation of the infrastructure to IP is a very important and radical change point for mobile communication, and it has also prepared the ground for the necessary technological infrastructure for the fifth and further generations.

The architectural infrastructure of the fifth generation mobile communication systems (5G) is different than the other generations. With the use of this generation, the mobile communication infrastructure will include a very different technology. Since the bandwidths of the 5th generation systems where different communication bands are planned to be used are planned to be used, it is foreseen to reach very high speeds in data transmission and internet communication and to switch to very different applications in mobile communication. The chart below (Figure 1) shows the years in which different generations emerged, their development trends and the number of global subscribers, taking into account the years. (Technology Futures Inch., 2018) As can be seen from this table, with the emergence of each new generation, the subscriber growth rate in the previous generation stops and the number of previous generation subscribers decreases as the years progress.

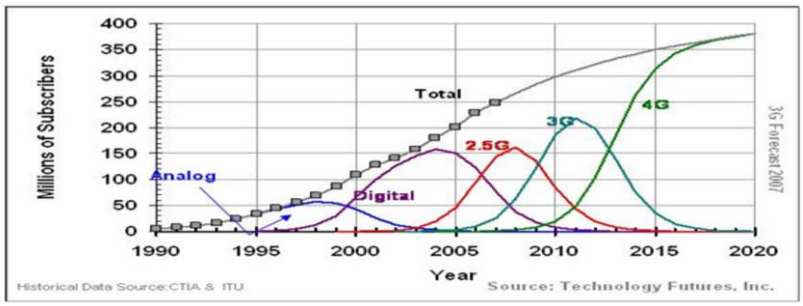

Figure 1. Diffusion of mobile technologies

Parallel to the developments in mobile communication generations in the IT sector, there is a significant increase in data usage. Because each next generation contains more broadband than the previous generation, and therefore the data transmission rate increases at that rate. As can be seen from the graphic below (IDC Global DataSpere, November 2018, Data Age 2025), the biggest increase in usage has been experienced since 2010. (1 Zettabyte = 1 billion x 1 Terabyte = 8*1021 bits = 1 billion means 1 TB hard disk). Because, as explained above, the use of mobile broadband first started with 3G systems and has increased exponentially every year

thereafter. Especially after 2011, when 4G started to be used, data rate and amount increased significantly and nearly doubled every year compared to previous generations (Acarer, 2017).

As can be seen from the chart below, it is predicted that the real increase in data usage will start with the widespread use of fifth generation systems and a much faster increase trend will be experienced after that (IDC Global DataSphere, November 2018). An increase in bandwidth means an increase in speed at the same rate. This means that much more data is used for different functions and services. Again, from the aforementioned graph, it is predicted that my data usage calculated in 2025 will be more than 150 times compared to 2010. The most important source in this will be the large bandwidth that 5G systems will provide and the increase in data usage due to speed.

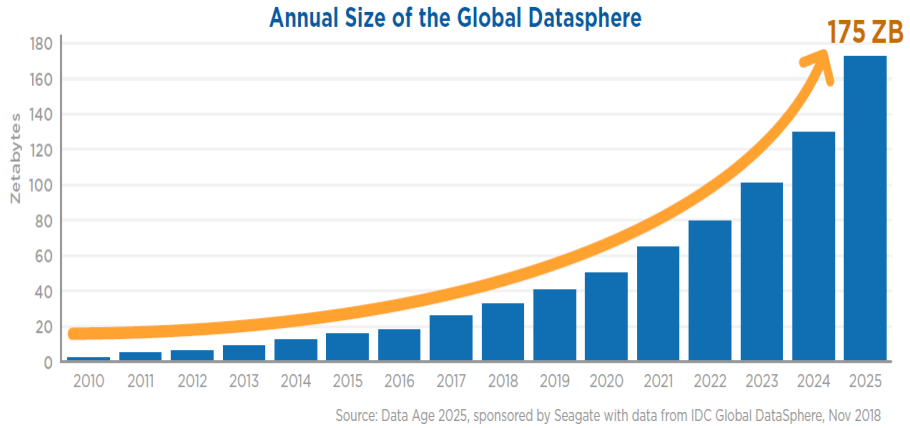

Figure 2. Annual size of the global datasphere

Evaluation of Big Data

Today, data is called "the raw material of our age". This fact has naturally been known by giant IT companies such as Google, Amazon, Twitter and Facebook from the very beginning, and this issue even lies at the basis of the founding philosophy of these companies (Ege, 2013). The volume and diversity of data in the world is still increasing at a rate never seen before in human history. With the penetration of internet technologies and social media into every phase of our lives and even our mobile phones, people have come to a point where they produce data even in their daily activities (Aktan, 2018). There are many resources such as smart phones, tablet computers, sensors, medical equipment, web traffic records, interactions in social networks and scientific research that offers solutions in fields such as pharmacy, meteorology, simulation (Schneider, 2012). In addition, the data stacks obtained by combining the data generated on websites, social media and mobile platforms from sensors and the internet of things and the data within the organizations have revealed the concept of "big data" (Goes, 2014).

However, the increasing heterogeneity of the web environment causes the provision of big data content in different media such as text, images and videos on web pages, and in genres such as encyclopedias, news, blogs, as well as subjects such as entertainment, sports, technology (Achsas & Nfaoui, 2017). Big data analytics is a technique used to analyze large data sets in order to obtain information that will guide the decision-making process (Gandomi & Haider, 2015). At the analysis stage, either all big data elements are combined or it is determined which big data element is relevant to the result to be obtained (Katal et al, 2013).

The century we live in is defined as the information age. Accordingly, the more data the businesses have or the more data they can access while continuing their activities, it is possible to make much healthier decisions by processing them. Because the larger the data, the better predictions can be made (Schönberger & Cukier, 2013). For this purpose, many businesses either employ software developers who can analyze the data in question, or they get this service from outside for a fee. In the meantime, many companies employ software personnel in order to evaluate the data for the service they provide within their own structure, and the functions of these units are gradually increasing.
One of the important reflections of the IT sector on all sectors is the increase in the productivity of companies serving in these sectors. The most important factor in this is that managers use the opportunities offered by the information sector and channel their expertise and knowledge to their work faster without wasting time on administrative issues. (Kolbjørnsrud et al., 2016) This naturally affects the service provided in businesses

positively. In big data analytics, it is possible to collect more data than necessary, which causes many security and privacy violations (Gahi, et al., 2016). In the meantime, it is necessary to take big data security measures in order to open the data to the outside world and thus prevent the data from falling into the wrong hands (Chandra et al., 2017).

Software Engineer Need

Software engineering is one of the most popular professions today. Software engineering is a science that deals with software. As representatives of this science, software engineers examine the requirements, design and structure of the software to be created in line with the needs of the users, or they create the software using programming languages. Depending on the development of informatics and the related internet, this field of engineering is increasing its effectiveness with each passing day. Today, many large and small companies employ software engineers of different qualifications. Because today, even companies that produce different hardware equipment use very serious software support in their activities, and software support is used in the development of all products.

In software engineering, which is one of the most special engineering fields of today and defined as "Software engineer" in the international literature, the most important problem faced by all companies is the supply of software developers with a certain level of knowledge. Because in order to provide services with sufficient efficiency in this field of engineering, only the education received at the university is not sufficient, it is necessary to closely follow all the developments in this field and make the necessary modifications in different programs according to the new software languages. Otherwise, a software language that is very popular and useful today and preferred by all segments may turn into a software language that is rather cumbersome and not preferred compared to new ones after a while. For this reason, a software developer who uses up-to-date software languages and can produce work on his own is still the most preferred and sought-after employee in the software industry.

It takes years of work experience to train an engineer of this quality. Because of in software projects, teamwork is generally done and each project member produces one side of the work. These studies are considered as a kind of internship activity for newly graduated software developers. Because software engineering stages generally require engineers and partners serving in different fields to work together (Giray & Uysal, 2017). Currently, there are approximately 140,000 Software Developer human resources in Turkey, and our country ranks 12th in Europe with this number. In this regard, Germany ranks first with approximately 837,000 Software Developers, England ranks second and third with 814,000 and France 467,000. Russia, Netherlands, Italy, Spain, Poland and Ukraine follow the top three countries in the number of software development personnel in Europe, respectively.

The most important problem experienced in this field during the pandemic process is that the said teamwork could not be done in general. Although teamwork is done online, its efficiency is far from face-to-face teamwork. Because it is very difficult to discuss and evaluate the opinions of other people in the online environment, this negatively affects the efficiency of the meeting at the same rate. The most negatively affected part of this situation is inexperienced software developers. Programmers of this nature, whose individual business development and project completion knowledge are quite weak, cannot find a job in general because they cannot find an environment where they can develop themselves.

Today, businesses usually establish teams for the projects they try to develop in the software they use in their activities, and there are senior officers called "Chief engineer" or "Senor engineer" in international terms. With the coordination of these senior officials, younger software developers, who are less experienced and generally defined as “junior”, take part in the meetings held at different periods, and different projects are implemented in this way. However, since face-to-face team work is done in very limited and difficult conditions, it becomes more difficult for inexperienced software developers to be trained quickly and to produce projects independently. It is possible to see many examples of this in the last 2 years. This problem has increased gradually during the pandemic process. Although there is still very little team work with online meetings, the general opinion is that the desired efficiency cannot be obtained from such meetings and that there are not enough software developers who can work independently, especially in the last 1.5 years.

It is possible to say that this issue has turned into a crisis in Turkey. Apart from this, many companies still have to use more financial resources and manpower to invest in high information capacity, which constitutes a different dimension of this issue. For this reason, many countries such as Iceland, Canada, Belgium, Germany

and Australia, which see the informatics sector as a repulsive field in recent years, have started to supply experienced and independent software developers from different countries. Serious fees are paid for these and human resources organizations are used. It is possible to define this function as fully trained software transfers.

This situation regarding experienced software developer transfers still continues at a rapid pace. This situation further increases the negative impact of the pandemic in countries that have lost such qualified software developers. In the last 2/3 years, like Turkey, many seriously trained software developers have lost due to these developments, and this process still continues to a large extent. We see the most important reflections of the developments in this field in our country. On the one hand, the need for software developers of this nature has increased, on the other hand, the wages of existing software developers have reached a level that will force the dimension of international competition.

Turkey sees software as an important area for its development in the IT sector. Despite the preparation and implementation of many incentive measures for this purpose, these developments are still seen as the most important obstacle to the development of our country in this regard. There is a sufficient level of young population in Turkey, even more than many other countries in the world. However, the fact that newly graduated software developers cannot find the opportunity to work in joint projects caused by the pandemic causes this problem to grow even more and its effect becomes negative.

One of the other important reflections of this ongoing process in our country is the increase in the domestic wages of the said personnel in a way that challenges the conditions of international competition. As a result of these developments, although the net salaries of such personnel in Turkey are still over $3,000/4,000, it is still not possible to obtain the required number and quality of software developers. According to the data of the IT Sector, the wages of experienced software personnel have increased by approximately % 45/50 in just the last year. This issue is still seen as the most important problem of both the software industry and other industries that use a large number of software developers in our country, and these developments take place as a serious disadvantage in the international competition of these organizations.

Recommendation for Solution

It is extremely difficult to find a permanent solution to this problem, which has emerged in recent years, in a short time. The most important factor in this is that the pandemic process is prolonged beyond everyone's estimates and that it is not known when it will be completed. Under these conditions, it seems very difficult for young and inexperienced software developers to grow up in a short time and carry out projects independently. From the beginning of the pandemic until today, as in many sectors, all companies in the software industry hoped that this process would end after a while. However, the gradual prolongation of the end of the pandemic delayed the taking of permanent measures to meet the need for software developers. For this reason, in the last few years, international human resources companies have started to intervene and they have started to act as an intermediary in the transfer of experienced software developers from Turkey to abroad, as well as from many countries. This process is still going on extremely intensely. This situation has led to an increasing need for software developers in our country and accordingly the problem on this issue. This issue is still one of the most important problems in the software industry of our country, and it does not seem to be resolved in the near future unless measures are taken. Already in the last few years, rising software developer fees cause software companies to suffer serious problems, especially in international competition. For this reason, in order to reduce the problem in question, or even to isolate it in the middle period and turn this issue into an advantageous situation for Turkey, it is of great benefit to make training programs in the software languages required by the software industry by making use of online communication opportunities. For this purpose, qualified trainers suitable for these programs and young software developers who will receive these trainings should be determined and the necessary economic support should be given to them during this training.

There is an appropriate amount of young software developers in Turkey who will receive the said training. According to Tübisad data, there are approximately 143.000 employees in the ICT Sector in our country, of which 33.000 work in communication and 1110.000 in the field of information technologies (Turkey's Digital Transformation Index Report, Tübisad, 2020). Although the number of employees in information technologies is less than in developed countries, it contains a very high number compared to many countries. In the Tübisad report, there is an increase of 7% in the field of information technologies, while the communication sector decreases by an average of 1% every year. The most important reasons for this are; In many universities in our

country, it is possible to determine the opening of departments in the fields of software and information technologies in recent years, the increase in their capacities and the increase in the interest in these departments.

In line with these evaluations, it can be said that the problem with the software is not in the number of personnel involved, the problem is a quality problem, and if adequate training is provided to these personnel, this issue can be turned from a disadvantage to an advantage for our country. For this, it is of great benefit that relevant NGOs in the IT sector, relevant public institutions and universities cooperate to ensure that training programs are provided in line with the above-mentioned evaluations. For this purpose, it is possible for relevant NGOs such as Yasad and Tübisad to make the necessary coordination. In addition, it is necessary to prepare training programs suitable for the required software areas and to provide financial support to the people who will receive the said training.

For this, the monetary balance of the training to be done should be prepared and appropriate projects should be implemented. Thus, it is possible to meet the need for experienced software developers in our country in a few years and to provide a serious resource to our country's economy by creating a serious employment. The applications related to conferences, working from home, meetings and training held online during the pandemic process have also prepared the necessary infrastructure for the above training program, and will allow the training in question to be carried out extremely quickly and at a reasonable cost.

In the meantime, it would be beneficial to follow an interactive course method in order to ensure maximum efficiency in the training to be given to software personnel. In this way, it is possible to make the training in question and answer form both more interactive and maximize its efficiency. Since the content of this training will be aimed at quality development rather than learning, it is thought that such an application will yield very positive results. Again, at the end of the training to be given on this subject, it is foreseen that the short and interactive exams held at the end of the departments will make a very important contribution to the efficiency of the said programs, instead of the general assessment exams.

Conclusion

While the pandemic process we have been experiencing for the last two years has created serious opportunities in informatics and especially in the software part of it, as in many sectors, it has also led to very complex problems. With the pandemic, especially online education, working from home, teleconferences, online meetings, etc. functions have provided great business resources for existing software companies. The software companies providing these services had great increases in their business volumes and export opportunities in this process. On the other hand, in the software industry, the problem of experienced software developers arose in this process. This problem negatively affected Turkey as well as all other countries, and its impact is still increasing.

The most important problem still experienced in the software industry is the need for experienced software developers who can work on projects individually. These personnel, called "Senor Engineer" or Chief Engineer in the software industry, are generally defined as software developers with 10/12 years of experience. In other words, the supply of project leaders or such personnel who can drag the projects on their own is a problem in all countries. In this regard, the inability of young software developers to work as a team during the pandemic and to stay away from project work is another negative development in the training of such personnel.

This problem in the software industry is valid for all countries, and Turkey is one of the countries that has been adversely affected by this issue. In this regard, especially EU countries such as the Netherlands, Belgium, Iceland, Germany, and countries such as Canada, Australia have started to import many experienced software developers with serious fees from countries with young and qualified software developers such as Turkey in recent years. Turkey is at the forefront of the countries that lost such personnel in this regard. This unfavorable situation for our country still continues at a rapid pace.

In order to solve this problem, what needs to be done in our country is the preparation of an action plan urgently. For this purpose, under the coordination of NGOs such as Yasad and Tübisad, public institutions and universities need to come together, decide on the required software languages and in which areas to provide training. With these training programs, it will be possible to train knowledgeable software developers in a very short time and in a reasonable time in the required software fields.

In this regard, there are software developers who have received the desired training in Turkey. While finding a solution to the problem of qualified software developers with the trainings to be made in this way, software developers can be trained in the languages and fields that the software industry needs, and this issue can be transformed into a serious economic gain for our country. For this purpose, the specified institutions should act together, training programs should be implemented by combining their capabilities within the framework of an action plan, and this should be presented to the informatics sector as a role model.

Scientific Ethics Declaration

The author declares that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the author.

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Author Information

Tayfun ACARER
Istanbul Bilgi University, Department of Computer Technologies, Istanbul, Turkey,
Contact E-Mail Address: tacarer@hotmail.com

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