THE IMPROVEMENT OF INTERNATIONAL TOURISTIC BUSINESS BASED ON THE MODEL OF INFORMATIONAL PRODUCTS DISTRIBUTION

DOSKONALENIE MIĘDZYNARODOWEGO BIZNESU TURYSTYCZNEGO W OPARCIU O MODEL DYSTRYBUCJI PRODUKTÓW INFORMACYJNYCH

Olga Sazonets, Marianna Hankina

Ukraine, National University of Water and Environmental Engineering, Academic and Research Institute of Economics and Management

Abstract. In the paper statistical data of Information technology development during 2008-2017 and a further forecast till 2019 are presented. They were found to increase by 115 billion dollars. The authors present references on the basis of using methods of dynamic programming in economic processes. Being based on the algorithm of building the model of dynamic programming the problem of the optimal distribution of information products among tourist enterprises functioning in the city of Dnipro (Ukraine) is solved. The purposeful function and restrictions concerning the problem of optimizing the usage of programming products are presented. As a result of calculations of the optimal distribution of information products among tourist enterprises the purposeful function is received, that shows the maximum additional income which constitutes 349000 thousand UAH. Information products are distributed as follows: the capacity of tourist operators is 6000 UAH, the capacity of tourist agencies is 5250 UAH, the capacity of aviation ticket offices is 750 UAH, the capacity of excursion bureaus is 3000, the capacity of enterprises of sports tourism is 2250 UAH, the capacity of enterprises of entrance/departure tourism is 2250 UAH. It was revealed that the needs of tourist enterprises of the city of Dnipro in information products are fully provided.

Keywords: information, information technologies, programming products, information products, tourist enterprise

Introduction

At present, in the first half of the 21st century, the role of information in human life is decisive - the more skills and knowledge one has, the higher one is valued as an expert and co-worker, the more respect one has in society. During the last decades it is insistently said about the transfer from “industrial society” to “information society”. The change is carried out by means of production, of the people’s
world outlook, of their way of living. Information
technologies change in a cardinal way the everyday
life of millions of people.
The research of this article is based on the
following methodical approaches:
- information has become one of the most
  important strategic, managerial resources,
  along with resources – human, financial,
  material ones;
- its production and use constitute the necessary
  basis of the efficient functioning and develop-
  ment of various spheres of society life, and,
  first of all, of economics;
- not only each human being has access to the
  sources of information in any part of our
  planet, and also the new information
  generated by it becomes the possession of the
  whole of mankind.
- under present conditions the right for
  information and the access to it are of vital
  value for all members of society.
- the wide use of information processes in
  international tourism is needed.

The distribution of information resources is of
practical value in economics. The underestimation
of its importance under market conditions leads to
economic losses. The distribution of information
resources is carried out with the help of a set of
various managerial decisions. Here, the enterprise
determines tasks for its future and methods for their
implementation. In this paper it is necessary to
solve the problem of the optimal distribution of
information resources among tourist enterprises
for their rational use. The necessity is the condition
in correspondence with which the resources quantity
is limited and the income growth for tourist enter-
prises here must be maximum.

Results and discussion

At present the world enters a new era – the in-
formation one, a century of electronic economic
activity, of network communities and organizations
without borders. The arrival of new time will change
cardinally the economic and social aspects of socie-
ty life. Similar changes in a very direct way concern
the place of man in the information world. A human
being changes in correspondence with the vector of
information-technical characteristics of society.
However, this is not altogether the passive adop-
tion of new conditions of production and consump-
tion. A human being performs as a subject of infor-
mation reality, that passes far above information-
technical characteristics. The informatization
of everyday life and the appearance of a new infor-
mation field of human existence does not occur
without traces for the real world of a human being.
In the electronic space behavioural standards and
value orientations of the personality are changed.

Tomasz Dychkovs’ky, Dzhoanna Dychkovs’ka
showed how information technology affects
the functions of the management system in Polish en-
Rafał Krzykawski stressed the importance of
information technology in Polish enterprises. (Ra-
fał Krzykawski, 2007). In particular, he highlighted
the IT use in Poland and Europe. He also
introduced perspectives for the development of IT
use.

The statistic depicts (Figure 1) spending on
global IT services from 2008 to 2019. In 2018,
spending on IT services is expected to amount to
around 1003 billion U.S. dollars worldwide. The IT
services market encompasses a range of services
that assist individuals and enterprises in implement-
ing, managing, and operating the wide variety of
processes, systems, software, equipment, and
peripherals that are used in the modern IT environ-
ment.
Thus, the informatization with each year all the more embraces almost all spheres of mankind's activity in the world. A problem appears with the efficient distribution of information resources in enterprises.

Technologies of resources distribution in the project among executors were studied in the paper by Hrynchenko, M.A. Tekhnolojiya (2013). In this work there had been presented a programme mechanism of implementing the algorithm of resources distribution. V.V. Tsyganok suggested the method of solving the problem of resources distribution using systems of supporting the adoption of solutions (Tsyhanok V.V., 2010). He used a modified genetic algorithm for solving a discreet problem. Kirik O.YE considered the process of distributing flows of restricted resources in energy systems in (Kirik O.YE, 2013) The paper analyzed the problem of the optimal loading of the product suppliers. The problem of the optimal resources distribution was also studied by foreign scientists Barkalov Y.V., Burkova A.V., Hlaholev V.N. Kolpachev (Barkalov Y.V., 2002). The optimal resources distribution in conditions of indistinct interval uncertainty was investigated by N.O. Brynza, V.A. Zatkhey, O.V. Vil’khivs’ka (2016). In paper (Cbitnyev A.I., 2011) the use of tied resources was studied. A.I. Sbitnev and V.V.Kozlov found the algorithm of distributing interrelated information resources (V.V. Kozlov, 2011).


Being based on the algorithm of building a model of dynamic programming, let us solve the problem of the optimal distribution of information products among tourist enterprises functioning in the city of Dnipro (Ukraine).

Let us write the mathematical statement of a problem. In the general form the problem of optimizing the use of programme products lies in choosing such a method of distributing between various enterprises of a tourist branch which will provide for the largest economic effect, or efficiency criterion. At the level of the enterprise or the branch the economic effect is determined as profit increment. In this way for our case the efficiency criterion is presented as the profit increment from the realization of information products. With its help the coverage of permanent expenditures of the enterprise and the obtaining of total profit are supported.

Then the limitations of the problem determining the domain of its solution will be the following:
1. The volume of information products implemented by enterprises of information sphere is not to exceed volumes of all manufactured information products.
2. The volume of information products realized to a particular enterprise is not to exceed its need for it.
3. The volume of presenting tourist services is not to exceed the capacities of tourist enterprises.
4. The enterprise-consumer of information products may manufacture only one kind of tourist service.
5. The profit from realizing information products does not depend on their redistribution among tourist enterprises.
6. The total profit equals the sum of income obtained from the realization of information products to each tourist enterprise.

Let us present the problem of the dynamic programming for distributing information products among enterprises of some sample from tourist a branch.

\( i \) – number of the enterprise manufacturing the information product for tourist enterprise where \( i = 1, I \);

\( l \) – total quantity of enterprises manufacturing the information product for tourism;

\( A_i \) – enterprises engaged in manufacturing information product;

\( j \) – enterprises, which use information product: \( j = 1, J \),

where \( J \) – number of tourist enterprises which are in need of information products of information enterprises of this sample;

\( B_j \) – number of tourist enterprises which are in need of information products of information enterprises of this sample; of \( b \)- kind;

\( b \) – ordinal number of the kind of tourist product manufactured using the information product of \( m \)- kind;

\( B = 1, B, m = 1, M \), where \( B \) – number of kinds of tourist product, \( M \) – number of kinds of information products used by tourist enterprises;

\( k \) – number of process steps;

\( S^n_b \) – total needs of \( B_j \) tourist enterprises in the information product of \( m \)- kind;

\( x^n_j \) – total volume of information products of \( m \)-kind, distributed among \( B_j \)- tourist enterprises;

\( g_j(x) \) – additional profit from realizing information product, \( j = 1, j \), \( 0 \leq x \leq S^n_b \)

The purposeful function of this problem is the maximum total additional profit under the optimum distribution of information products among different tourist enterprises:

\[ Z = \sum_{j=1}^{J} g_j(x^n_j) \rightarrow \max \quad (1) \]

Limitations for this problem will be the following:

\[ x^n_j \geq 0, \ j = 1, J \quad (2) \]

\[ \sum_{j=1}^{J} x^n_j \leq S^n_b \quad (3) \]

Let us consider the main stages of implementing this model. To develop the model statistical data concerning the development of information products were handled by enterprises of the city of Dnipro: native and foreign literature, records of enterprises operating on the market of information produce, information of periodicals, information resources of Internet network. The model is calculated for 2016.

Manufactures of information products in Ukraine conduct for tourist enterprises:
- maintenance of tourist firm site;
- filling-in pages of content in facebook, etc;
- purchase of traffics;
- prices arbitration;
- discount systems;
- sms- dispatch.

Consumers of information products are such types of tourist enterprises:
- tourist operator;
- tourist agency;
- aviation booking office;
- excursion bureaus;
- enterprises in sport tourism;
- enterprises of entrance/departure tourism.

To preserve the confidential information about the economic activity of private enterprises and because of the impossibility of getting the official data enterprises are assigned in correspondence with directions of activity conditional names for capacities:

\( B_1 \) – tourist operator;
\( B_2 \) – tourist agency;
\( B_3 \) – aviation ticket office;
\( B_4 \) – excursion bureau;
\( B_5 \) – enterprises of sport tourism;
\( B_6 \) – enterprises of entrance/departure tourism..

Data about demands for information products are measured in UAH and are placed in Table 1.
Table 1. Demands of tourist enterprises in c. Dnipro for information products (UAH)

<table>
<thead>
<tr>
<th>Name of assortment</th>
<th>Consumers and their demand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tourist operator</td>
</tr>
<tr>
<td>Balances</td>
<td>6000</td>
</tr>
</tbody>
</table>

Source: compiled by authors on the basis of reports about volumes of tourist enterprises activity.

Initial data about volumes of manufacturing informational products and demands of tourist enterprises for them are approached to real demands for each of them. This model has certain limitations and assumptions for application.

1. Calculations presented in accordance with the model permit to partially carry out the distribution of information resources because here are not considered the demands of enterprises of other kinds of economic activity for information products, apart from tourist enterprises of c. Dnipro.

2. The model is a local one because only enterprises of the tourist branch in c. Dnipro are analyzed and the demands of tourist enterprises and proposals of enterprises of information sphere of other regions and towns of Ukraine are not considered.

3. Some initial data, are approximate ones, because of the confidential information about tourist and information activity of enterprises.

Limitations and assumptions were used due to the partial absence of information about demands of tourist enterprises from other towns for information resources. But under the condition of the information availability the model will take into account all these aspects.

Let us realize the model in practice and analyze obtained results. Information enterprises of some sample \( A_1 \) manufactured information products for the sum of 19500 UAH, which are to be distributed between tourist enterprises with such capacities \( B_1 = 6000 \) UAH, \( B_2 = 5000 \) UAH, \( B_3 = 500 \) UAH, \( B_4 = 4000 \) UAH, \( B_5 = 2000 \) UAH, \( B_6 = 2000 \) UAH. Issuing from this, demands of tourist enterprises for information products constitute \( B_1 + B_2 + B_3 + B_4 + B_5 + B_6 = 19500 \) UAH. Hence, problem specification meets limitation (2) is presented in a tabular form (Table 2). It is necessary to distribute information products among tourist enterprises in such a way as to receive maximum profit.

Let us present the economic-mathematical model of problem solution. Let us write down the purposeful function - the maximum additional profit from realization on the basis of formula (1) in the form:

\[
Z = \sum_{j=1}^{6} g_j (x_j^m) \rightarrow \max
\]  (4)

Let us write down limitations to this problem:

\[
x_j^m \geq 0, j = 1, 6
\]  (5)

\[
\sum_{j=1}^{6} x_j^m \leq 19500
\]  (6)

It is necessary to find variables \( x_j^m \), which satisfy limitations (5), (6) and maximize function (4). The purposeful function \( Z_k = (S_{k-1}^m) \) will signify conditionally optimal profit, obtained from \( j \), \((j+1)\)… 6-th enterprise if among them resources were distributed in an optimum way \( S_{k-1}^m \) \( (0 \leq S_{k-1}^m \leq 19500) \). Allowable solution at \( k \)-th step meet the condition \( 0 \leq x_j^m \leq S_{k-1}^m \). This means that for the \( j \)-th enterprise nothing will be allocated, or there will be allocated not more than kept at \( k \)-th step.

Let us use initial data (Table 1), table 2 and methods of dynamic programming for calculating the optimum distribution of balances among tourist enterprises. Calculations will be done with the help of information system MS Excel. The algorithm of calculation is automated with the help of this programme. Calculation results are given in Table 3.

Results of maximizing profit increment using the method of passing in reverse order are singled out in table 3. As a result of calculations done of the optimum distribution of information products among tourist enterprises we received the purposeful function which shows the maximum additional profit from realizing information products and amounts to 3490000 thousand UAH if information products are distributed in such a way: \( B_1 = 6000 \), \( B_2 = 5250 \), \( B_3 = 750 \), \( B_4 = 3000 \), \( B_5 = 2250 \), \( B_6 = 2250 \).
Table 2. Profit increment of tourist enterprises from realizing information products, UAH

<table>
<thead>
<tr>
<th>Cost of information products</th>
<th>( g_1(x) )</th>
<th>( g_2(x) )</th>
<th>( g_3(x) )</th>
<th>( g_4(x) )</th>
<th>( g_5(x) )</th>
<th>( g_6(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>750</td>
<td>30000</td>
<td>30000</td>
<td>75000</td>
<td>18000</td>
<td>22000</td>
<td>21000</td>
</tr>
<tr>
<td>1500</td>
<td>40000</td>
<td>40000</td>
<td>74000</td>
<td>19000</td>
<td>23000</td>
<td>24000</td>
</tr>
<tr>
<td>2250</td>
<td>60000</td>
<td>45000</td>
<td>72000</td>
<td>21000</td>
<td>25000</td>
<td>25000</td>
</tr>
<tr>
<td>3000</td>
<td>75000</td>
<td>55000</td>
<td>70000</td>
<td>23000</td>
<td>24000</td>
<td>23000</td>
</tr>
<tr>
<td>3750</td>
<td>85000</td>
<td>60000</td>
<td>67000</td>
<td>24000</td>
<td>22000</td>
<td>22000</td>
</tr>
<tr>
<td>4500</td>
<td>95000</td>
<td>70000</td>
<td>65000</td>
<td>25000</td>
<td>21000</td>
<td>20000</td>
</tr>
<tr>
<td>5250</td>
<td>110000</td>
<td>75000</td>
<td>63000</td>
<td>23000</td>
<td>19000</td>
<td>19000</td>
</tr>
<tr>
<td>6000</td>
<td>125000</td>
<td>72000</td>
<td>61000</td>
<td>22000</td>
<td>17000</td>
<td>17000</td>
</tr>
<tr>
<td>6750</td>
<td>115000</td>
<td>71000</td>
<td>60000</td>
<td>19000</td>
<td>16000</td>
<td>14000</td>
</tr>
<tr>
<td>7500</td>
<td>110000</td>
<td>71000</td>
<td>57000</td>
<td>17000</td>
<td>15000</td>
<td>11000</td>
</tr>
<tr>
<td>8250</td>
<td>100000</td>
<td>70000</td>
<td>54000</td>
<td>15000</td>
<td>13000</td>
<td>10000</td>
</tr>
<tr>
<td>9000</td>
<td>90000</td>
<td>68000</td>
<td>53000</td>
<td>14000</td>
<td>12000</td>
<td>9500</td>
</tr>
<tr>
<td>9750</td>
<td>85000</td>
<td>66000</td>
<td>52000</td>
<td>12000</td>
<td>10000</td>
<td>8500</td>
</tr>
<tr>
<td>10500</td>
<td>75000</td>
<td>63000</td>
<td>51000</td>
<td>10000</td>
<td>9000</td>
<td>8000</td>
</tr>
<tr>
<td>11250</td>
<td>60000</td>
<td>60000</td>
<td>48000</td>
<td>9000</td>
<td>8000</td>
<td>7500</td>
</tr>
<tr>
<td>12000</td>
<td>55000</td>
<td>57000</td>
<td>45000</td>
<td>8500</td>
<td>6000</td>
<td>7000</td>
</tr>
<tr>
<td>12750</td>
<td>45000</td>
<td>54000</td>
<td>44000</td>
<td>8000</td>
<td>5500</td>
<td>6000</td>
</tr>
<tr>
<td>13500</td>
<td>40000</td>
<td>51000</td>
<td>40000</td>
<td>7500</td>
<td>5000</td>
<td>5500</td>
</tr>
<tr>
<td>14250</td>
<td>35000</td>
<td>48000</td>
<td>42000</td>
<td>7000</td>
<td>4000</td>
<td>5000</td>
</tr>
<tr>
<td>15000</td>
<td>30000</td>
<td>44000</td>
<td>38000</td>
<td>6200</td>
<td>3500</td>
<td>4500</td>
</tr>
<tr>
<td>15750</td>
<td>25000</td>
<td>40000</td>
<td>36000</td>
<td>6000</td>
<td>3100</td>
<td>4000</td>
</tr>
<tr>
<td>16500</td>
<td>20000</td>
<td>36000</td>
<td>32000</td>
<td>5800</td>
<td>2900</td>
<td>3500</td>
</tr>
<tr>
<td>17250</td>
<td>20000</td>
<td>32000</td>
<td>30000</td>
<td>5500</td>
<td>2700</td>
<td>3000</td>
</tr>
<tr>
<td>1800</td>
<td>15000</td>
<td>30000</td>
<td>2500</td>
<td>3400</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td>18750</td>
<td>10000</td>
<td>28000</td>
<td>2200</td>
<td>5300</td>
<td>2400</td>
<td>2000</td>
</tr>
<tr>
<td>19500</td>
<td>5000</td>
<td>25000</td>
<td>2000</td>
<td>5000</td>
<td>2100</td>
<td>1900</td>
</tr>
</tbody>
</table>

Source: compiled by authors on the basis of reports about volumes of tourist enterprises activity.
Table 3. Calculation of optimum distribution of balances among enterprises of the tourist sphere in c. Dnipro

<table>
<thead>
<tr>
<th>Demand for informational products</th>
<th>( k=1 )</th>
<th>( k=2 )</th>
<th>( k=3 )</th>
<th>( k=4 )</th>
<th>( k=5 )</th>
<th>( k=6 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( S=15000 )</td>
<td>21000</td>
<td>21000</td>
<td>750</td>
<td>22000</td>
<td>750</td>
<td>19000</td>
</tr>
<tr>
<td>( S=25000 )</td>
<td>25000</td>
<td>25000</td>
<td>2250</td>
<td>25000</td>
<td>2250</td>
<td>2250</td>
</tr>
<tr>
<td>( S=30000 )</td>
<td>23000</td>
<td>22500</td>
<td>22000</td>
<td>43000</td>
<td>22000</td>
<td>22000</td>
</tr>
<tr>
<td>( S=37500 )</td>
<td>22000</td>
<td>25000</td>
<td>2250</td>
<td>45000</td>
<td>2250</td>
<td>2250</td>
</tr>
<tr>
<td>( S=40000 )</td>
<td>20000</td>
<td>22500</td>
<td>22000</td>
<td>70000</td>
<td>2250</td>
<td>2250</td>
</tr>
<tr>
<td>( S=50000 )</td>
<td>19000</td>
<td>22500</td>
<td>21000</td>
<td>137000</td>
<td>2250</td>
<td>2250</td>
</tr>
<tr>
<td>( S=60000 )</td>
<td>17000</td>
<td>22500</td>
<td>17000</td>
<td>60000</td>
<td>2250</td>
<td>2250</td>
</tr>
<tr>
<td>( S=67500 )</td>
<td>14000</td>
<td>22500</td>
<td>16000</td>
<td>50000</td>
<td>17000</td>
<td>2250</td>
</tr>
<tr>
<td>( S=75000 )</td>
<td>11000</td>
<td>22500</td>
<td>15000</td>
<td>50000</td>
<td>15000</td>
<td>74000</td>
</tr>
<tr>
<td>( S=82500 )</td>
<td>10000</td>
<td>22500</td>
<td>15000</td>
<td>50000</td>
<td>15000</td>
<td>74000</td>
</tr>
<tr>
<td>( S=90000 )</td>
<td>9000</td>
<td>22500</td>
<td>12000</td>
<td>50000</td>
<td>12000</td>
<td>74000</td>
</tr>
<tr>
<td>( S=97500 )</td>
<td>8500</td>
<td>22500</td>
<td>10000</td>
<td>50000</td>
<td>10000</td>
<td>74000</td>
</tr>
<tr>
<td>( S=106000 )</td>
<td>8000</td>
<td>22500</td>
<td>9000</td>
<td>50000</td>
<td>9000</td>
<td>74000</td>
</tr>
<tr>
<td>( S=112500 )</td>
<td>7500</td>
<td>22500</td>
<td>8000</td>
<td>50000</td>
<td>8000</td>
<td>74000</td>
</tr>
<tr>
<td>( S=120000 )</td>
<td>7000</td>
<td>22500</td>
<td>6000</td>
<td>50000</td>
<td>6000</td>
<td>74000</td>
</tr>
<tr>
<td>( S=127500 )</td>
<td>6500</td>
<td>22500</td>
<td>5000</td>
<td>50000</td>
<td>5000</td>
<td>74000</td>
</tr>
<tr>
<td>( S=135000 )</td>
<td>6000</td>
<td>22500</td>
<td>4500</td>
<td>50000</td>
<td>4500</td>
<td>74000</td>
</tr>
<tr>
<td>( S=142500 )</td>
<td>5500</td>
<td>22500</td>
<td>4000</td>
<td>50000</td>
<td>4000</td>
<td>74000</td>
</tr>
<tr>
<td>( S=150000 )</td>
<td>5000</td>
<td>22500</td>
<td>3500</td>
<td>50000</td>
<td>3500</td>
<td>74000</td>
</tr>
<tr>
<td>( S=157500 )</td>
<td>4500</td>
<td>22500</td>
<td>3100</td>
<td>50000</td>
<td>3100</td>
<td>74000</td>
</tr>
<tr>
<td>( S=165000 )</td>
<td>4000</td>
<td>22500</td>
<td>2700</td>
<td>50000</td>
<td>2700</td>
<td>74000</td>
</tr>
<tr>
<td>( S=172500 )</td>
<td>3500</td>
<td>22500</td>
<td>2300</td>
<td>50000</td>
<td>2300</td>
<td>74000</td>
</tr>
<tr>
<td>( S=180000 )</td>
<td>3000</td>
<td>22500</td>
<td>2000</td>
<td>50000</td>
<td>2000</td>
<td>74000</td>
</tr>
<tr>
<td>( S=187500 )</td>
<td>2500</td>
<td>22500</td>
<td>1800</td>
<td>50000</td>
<td>1800</td>
<td>74000</td>
</tr>
<tr>
<td>( S=195000 )</td>
<td>2000</td>
<td>22500</td>
<td>1500</td>
<td>50000</td>
<td>1500</td>
<td>74000</td>
</tr>
</tbody>
</table>

Source: compiled by authors on the basis of reports about volumes of tourist enterprises activity.
Conclusions

The paper disclosed basic information products which are used by tourist enterprises. The problem is solved in accordance with which it is necessary to distribute information products among tourist enterprises in such a way for the income increment of tourist enterprises to be maximum. As a result of the used economic-mathematical model of dynamic programming the optimum distribution was received of information products among enterprises of the tourist branch. It is revealed that demands of tourist enterprises in c. Dnipro for information products are completely provided for.

References


