

RECENSION

С.А. "Д.А. Тенев" - Свишлов
Вх № 93-00-31/30.08.2021г.

Reviewer: Prof. Dr. Nikolay Hristov Sterev, University of National and World Economy (scientific specialty: 05.02.18 Economics and Management, 3.8. Organization and Management of Production)

Author of the dissertation: Emre Zafer Guney

Dissertation topic: ALGORITHMS TO FORECAST WORKFORCE

Grounds for submitting the review: participation in the composition of the Scientific Jury according to Order № 406 / 30.06.2021. of the Rector of the Academy of Economics "DA Tsenov".

I. General presentation of the dissertation:

1. Subject and object:

Subject of the dissertation: The main subject of research is defined as *establishing algorithms for workforce requirements per 30 minutes periods and flexible data driven schedules for the departments of Cashiers, Stockers and Butchers with the help of time study observations and sales data analysis with the tools of python and cplex*. Thus defined subject is correct and reflects the content of the dissertation research.

The object of the dissertation is: *is increasing workforce management efficiency in Migros, Turkey's one of the biggest grocery retail company's stores*. Thus, the dissertation is not focused on the need or lack of arguments for improving the efficiency of workforce management in general, but on the approaches, methods and tools for achieving this in a specific organization of work, typical of large chain stores. retail. I appreciate this approach and thus the doctoral student is able to fulfill the goals and objectives of the dissertation.

Moreover, I accept as completely accurate the defined limitations in the dissertation research, as outside the subject and object of the study are left the organizational issues of labor organization in separate units / specializations / in retail trade and the existence of flexible schemes of labor organization and work time.

2. Goals and tasks:

The main goal is the following: *is having a shared language that connects workforce metrics to business outcomes in terms of helping grocery retailers benefiting of increase in workforce efficiency and lowering workforce costs by establishing algorithms for 30 minutes periods employee requirements and scheduling of Cashier, Stocker and Butcher's departments*. The goal defined has found expression in the decomposition of 5 specific tasks of the dissertation work, which are realized through the chosen structure of the dissertation research.

I believe that the approach used to define the purpose and tasks in the dissertation work fully corresponds to the author's thesis defined by the doctoral student.

3. Dissertation thesis:

The main thesis is *having an algorithm-based scheduling for cashiers, stockers and butchers supporting with time study observations' empirical data and the sales data analysis can result efficiency increase in workforce management of these departments, therefore company can lower the employee costs of the operation and get in an advantage position compare to its opponents*.

The derived thesis can be assessed as correctly set and subsequently successfully defended in the overall content of the dissertation.

4. Volume of the dissertation

The dissertation, developed and presented by *Emre Zafer Güney* on the topic "*Algorithms to forecast workforce*" is a volume of 232 standard pages. and contains: an introduction, a four-chapter exposition, a conclusion, a list of references and appendices with a volume of 38 pages. The main part of the work contains 102 tables and 19 figures. The volume, structure and content of the dissertation can be assessed as completely satisfactory for the award of PhD degree.

5. Structure (introduction, presentation and conclusion) of the dissertation

Structurally, the main text of the dissertation is presented in four separate chapters with character respectively: introduction to the theory of the problem, methodical description of the subject and object of the dissertation and applied research of the object of research: Migros, one of the largest retail stores in Turkey. Each of these structural elements has its independence and completeness and at the same time expresses the logical model of the doctoral student by having a clear, accurate and completely correct connection and consistency between the different parts of the dissertation.

6. References

The list of used literature includes 114 titles, including 14 in Turkish and 99 in English and 1 in French. 28 internet sources (in Turkish, English and French) were also used. The used literature is modern, covers important and significant aspects of the theory of organization and planning of the workforce, as well as essential applied aspects of forecasting and planning of the workforce through various mathematical tools.

7. Annex

The dissertation is accompanied by 4 certificates for mastery of mathematical instruments and 48 tables, specifying the figures and tables presented in the exposition of the dissertation. The annexes presented in this way complement the main text of the dissertation and are completely correctly taken out of the main body.

II. Assessment of the form and content of the dissertation.

1. Assessment of the relevance of the scientific problem in the dissertation

The relevance of the topic is indisputable and it stems from the growing role of labor in modern business, on the one hand, and the growing number of enterprises in the service sector that use the industrial type of organization and management of labor.

However, the issues of the "industrialization" of retail in terms of the organization and management of the workforce have not yet been fully explored. On the one hand, there are the basic industrial principles for specialization, combination and cooperation, which leads to a reduction in the total labor costs of companies, but on the other hand it is associated with increasing labor requirements and hence - increasing the cost of labor per employee. All this requires the development of specific mathematical tools for forecasting the required workforce in retail, through which tools to balance the opposite impact of labor for retail companies, and in this case: in Migros, one of the largest retail stores in Turkey.

The arguments presented by the doctoral student in defense of the relevance of the topic are important and undoubtedly present not only in the introductory part of the

dissertation, but are the main line motivating the development of theoretical and applied issues of the dissertation study.

2. Analysis of the degree of development of the researched problems by other scientists

From the presented theoretical study, one 2% of the world's publications on the organization and management of labor relate to retail trade. In view of the specific organization of labor in this sector, there are still a number of untapped opportunities for increasing the efficiency of the organization of the labor force in this sector.

Moreover, in recent years the type and form of organization of enterprises in the retail sector has changed. The transition to industrial forms of organization of enterprises in this sector raises even more acute the issue of labor organization. In addition, although not covered in the dissertation, the COVID-19 raises important questions about the organization of work in these enterprises.

In addition, new mathematical tools for working with large databases have entered in recent years, something that seems unthinkable in the 1960s and even the 2000s. The new toolkits allow big data to be used to make much more accurate models for forecasting the need for retail labor not only during the day, but also within one work shift and work week.

All these issues, with the achievements of science and practice, incl. with the outline of the "white spots" in them are presented from a scientific point of view in the first chapter of the dissertation research, and from an applied point of view in the fourth chapter of the dissertation.

3. Opinion on the volume of the dissertation

The dissertation, developed and presented by *Emre Zafer Güney* on the topic "*Algorithms to forecast workforce*" is a volume of 232 standard pages and contains: an introduction, a four-chapter exposition, a conclusion, a list of references and appendices with a volume of 38 pages. The volume, structure and content of the dissertation can be assessed as completely satisfactory for the award of PhD degree.

4. Opinion on the quality and number of the offered illustrative material - schemes, graphs, tables, etc.

The dissertation, developed and presented by *Emre Zafer Güney* on the topic "*Algorithms to forecast workforce*" contains 102 tables and 19 figures. The proposed illustrative material in the dissertation can be assessed as completely satisfactory and presents important evidence to the main author's theses and evidence to them, which undoubtedly increase the quality of the dissertation. Moreover, 48 tables, concretizing the presented figures and tables in the exposition of the dissertation, are presented in the appendix as completely correctly they are taken out of the main body.

5. Attitude in scientific, linguistic and stylistic editing

The style and author's language used in the development of the dissertation can be assessed positively. The style is strictly scientific and the language is understandable. The volume of the exposition, as well as the used set of approaches and methods for applied and theoretical analysis are completely correct and allow to fulfill the set tasks and to realize the set main goal of the dissertation research.

6. Assessment of the correctness and the need for statistical processing of empirical data

In the dissertation work there are 5 programs for data processing, incl. and big data: R Analysis Program, Microsoft Excel, SPSS, Python, and CPLEX (pp. 37-39).

The use of these programs was performed in the processing and analysis of data from the object of study: Migros, one of the largest retail stores in Turkey. The use of these programs allows statistical processing and subsequent analysis, incl. and by using mathematical algorithms to forecast the workforce, to be highly valued.

7. Opinion on the extent to which the candidate has complied with the rules of scientific ethics

Upon review of the submitted publications, no evidence was found and / or no reports of copyright infringement of other researchers were found at the time of writing the review.

8. Opinion on the extent to which the abstract accurately and fully reflects the work.

The presented content of the dissertation has found their adequate place in the submitted for review Abstract of the dissertation. The abstract is in a volume of 48 pages and correctly presents the main theses, conclusions and results presented in the dissertation. The structure and content of the abstract are in accordance with legal and regulatory requirements. The presented evidence on the dissertation: 3 articles and 1 report from an international scientific conference, reflect essential parts of the dissertation and fully meet the requirements for obtaining the PhD degree.

III. Scientific and scientific-applied contributions to the dissertation.

1. Main scientific and / or scientific-applied results

The main results achieved in the dissertation research can be presented in 2 main groups:

1. scientific results: the main scientific results are related to generalizations of the theoretical formulations related to the subject and the object of the dissertation research. The following can be singled out as more significant:

- The essential aspects of the emergence of the science of labor management have been studied by examining various evolutionary theories from the 1960s and 1970s. This allowed the doctoral student to synthesize the basic requirements for the organization and management of labor in business organizations, and especially in retail. (str.15-30)

- The historical foundations of the theoretical and applied tools for planning and organizing working time from Taylor to the present day have been studied. (str.31-32)

- basic tools for measuring and managing working time are presented (p.32-39).

2. scientific-applied results: the main (scientific-) applied results are related to the methodological and applied issues presented in the dissertation. The following can be singled out as more significant:

- The main characteristics of the global retail sector for the last 10 years are presented, as well as the challenges of the COVID-19 crisis for retailers. Particular attention is paid to the development of this sector in Turkey (pp.42-62). In this direction, the systematization of the analyzes in the SWOT analysis of the Retail Trade in Turkey deserves a positive assessment (pp. 57-58).

- an applied analysis of the activities and their time management of 3 departments was carried out: cashier, Stocker, Butcher (p.73 - 120) and in addition to systematizing the main activities of each position, an algorithm for time management was proposed for the implementation of these activities in each workplace.

- on the basis of a proposed mathematical algorithmic model (p.122-129) a test and analysis of the required number of employees during the day and within the week was conducted for each of the 3 departments: cashier, Stocker, Butcher (p. 130 - 179)

In conclusion, the dissertation presented by *Emre Zafer Güney* demonstrates the existence of a number of scientific and applied scientific achievements, which are the result of the implementation of the research tasks. The above results are author's and are indisputable. Many of them are the basis of the assessment of the availability of scientific and scientific-applied contributions of the dissertation.

2. Scientific and scientific-applied contributions in the dissertation

The structure and content of *Emre Zafer Güney's* doctoral dissertation on "*Algorithms to forecast workforce*" are grounds for concluding that the dissertation submitted for review has a number of indisputable contributions. In theoretical and applied terms, the contributions reflect the modernization of the use of various tools for planning, organizing and managing working time in Retail, which theoretical concepts have been applied in terms of key factors determining the management of working time in selected sites and for selected positions from the main object of the dissertation: Migros, one of the largest retail stores in Turkey. Accordingly, I fully accept the four contributions defined by the doctoral student in the dissertation and they can be *divided into two groups*:

- *scientific contributions:*
 - Based on analyzed literature sources and models applied in other subsectors such as: financial, manufacturing, and trade sectors, various algorithms and their software application have been identified to optimize working hours for individual positions in retail trade.
 - By applying an appropriate mathematical approach to key indicators for assessing the organization of labor have been developed and proposed, incl. and application-tested algorithms for planning the organization of work in retail trade. Particular emphasis is placed on the fact that the proposed and presented algorithms can be improved to predict the labor force requirements at the department / unit level of individual retailers.
- *applied contributions:*
 - Based on the author's methodology for data research and analysis, has been developed and tested as an organizational and management tool for searching and identifying opportunities to achieve efficiency in time management of cashier, Stocker, Butcher, based on the key Scheduling Efficiency Rate (SER).
 - Through the development, testing and implementation of the workforce forecasting algorithm, the work schedules of retail outlets in the study site have been optimized: Migros, one of the largest retail stores in Turkey.

IV. Critical notes, questions and recommendations on the dissertation.

My general opinion is that the dissertation presented by *Emre Zafer Güney* does not have significant omissions or obvious errors that would reduce my assessment of the qualities of the work.

Notwithstanding the evidence presented in the review for a number of indisputable positive aspects and contributing moments of the doctoral dissertation, the following question can be asked:

- *Is it possible to derive an aggregate mathematical algorithm that allows cooperation and combination of several work positions within the management of staff working hours?*

V. Summary conclusion and opinion.

The dissertation proposed by *Emre Zafer Güney* on the topic " *Algorithms to forecast workforce*" fully meets the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for the implementation of ZRASRB and the Rules for obtaining PhD degree at the Academy of Economics "DA Tsenov".

Given the above positive aspects of the structure and content of the dissertation, scientific and applied results and contributions to it, as well as the qualities of the author, I believe that the dissertation is a complete original author's research. All this gives me reason to express my POSITIVE opinion of *Emre Zafer Güney* to award the PhD degree in the professional field 3.8. Economics, scientific specialty: "Economics and Management (Industry)".

Date: 13 August 2021

Reviewer:
(Prof. Dr. Nikolay Sterev)