

# WEB PORTAL FOR STRESS LEVEL AND BURNOUT RESILIENCE ASSESSMENT FOR SCHOOL TEACHERS IN BULGARIA

Nikolay Pavlov, Veselina Naneva, Youri Yanakiev

**Abstract.** *In this paper we discuss the challenges to developing a portal for stress level and burnout resilience assessment for schoolteachers in Bulgaria, such as scalability, data anonymization, security, and accessible user interface. Scalability is achieved through write-only data sharding in a microservice-like model. Data shards enable parallel utilization of smaller datasets across scaling nodes. We review data anonymization techniques which allows us to associate together multiple test results of the same individuals while retaining full anonymity of users, which is the key requirement of such a web portal. Based on the necessity for a responsiveness and an appropriate user experience for expectedly elevated stress levels users, we describe the methodology for designing the user design.*

**Key words:** Stress Resilience Testing, Scalability, Anonymous Assessment, Accessible User Interface.

## Introduction

There are more than 50 000 pedagogical specialists in all educational institutions in the system of preschool and school education in Bulgaria. It can be assumed that some of them have at some point suffered or experienced stress at work. The dynamics and constant changes in the educational system, the challenges of the modern e-world, the hectic lifestyle can increase the levels of stress reaching the stages of depression or even burnout in the pedagogical specialists. The situation is made graver by the lack of adequate psychological assistance and support available to them. Precisely for this reason, the development of a web portal for stress level and burnout resilience assessment is with key importance to facilitate the base requirement for stress levels data summarization for the users of the corresponding sphere. The result of this assessment can be used for providing new solutions for improving mental resilience in educational specialists.

The StressPortal was created for pedagogical specialists and is the first systematic approach to reducing stress and building psychological re-

silience in education professionals in connection with the third stage of the program of the Ministry of Education and Science “Diagnosis and prevention of the risk of burnout syndrome and development of resilience in pedagogical specialists”. It is a set of two interconnected independent products, such as a specialized site with information sections and a testing module application, displaying a result based on the personally entered anonymous answers of each user.

### **Web portal architecture**

The informative StressPortal site provides all the required information for the topics related to stress, burnout syndrome and psychological resilience. In addition to that, it shares 33 recommendations for stress reduction which are formed as a content by the Faculty of Pedagogy of Paisii Hilendarski University of Plovdiv. The key aspect of assessment is a web questionnaire application, specially tailored for the use case and target audience, which covers the demand for data anonymization and provide several punctual surveys by the help of which the corresponding user can access his/her personal results. It contains a stress thermometer, demographic inquiries, specialized questionnaires for the state of stress and resulting views.

### **Data Anonymization**

The anonymization of the completed questionnaires is a key requirement for the developed portal. Prerequisite for complication of the process for ensuring the anonymization is the functional requirement of the Ministry of Education and Science, the access point of the web portal user to be the educational system of the Republic of Bulgaria, guaranteed through the its’ user authentication platform. Such authorization is made by the Microsoft Entra ID, which is a cloud-based identity and access management service that allows users to access external resources [1].

Simultaneously with the approach of the data anonymization, for the purposes of the psychological research, it is necessary for the system to recognize when the same user fills out the questionnaires multiple times. Thus, there is a method implemented, which covers the ability the proposed portal to convert the user identification received from Microsoft Entra ID of the Ministry of Education into an anonymous code through hashing.

The process of hashing is implemented by the help of Security Hash

Algorithm-256 (SHA-256) [2]. It takes a value as a message of length less than 264 bits and produces a 256-bit hash value. In each iteration of it, its length becomes a multiple of 512, and afterwards each 512-bit message block is processed as an input iterative structure. The output chaining value of the previous iteration is an input chaining one for the following iteration with 256-bit chaining value and a 512-bit message block. Based on this formed algorithm, it can be considered that for the desired number of pedagogical specialists as  $M$ , the probability of duplicate values, so called collision in SHA-256, satisfy the result  $p$  in:

$$p = \frac{M.(M - 1)}{2^{256}}.$$

This probability value guarantees a unique code for each user. Hashing functions are strictly one-way. It is impossible to produce the original input value from the output of the singular one. The developed system stores only the result of the SHA-256 hash function for each user's identity, thus ensuring the anonymity of users.

### **Architecture Scalability**

The StressPortal Questionnaire application is a standalone application with no dependencies on external processes, based on Microsoft .NET version 8 and ASP.NET. Since Microsoft .NET 8 ASP.NET is a cross-platform technology, it can be installed on Windows and Linux operating systems and existing web servers [3].

The developed tool uses a relational database to store the information. Although the subject area of the project is suitable for using a document database, the choice of a relational database was necessary due to the fact that:

- there is a requisite of insurance the logical integrity of the data in order to track the completeness of the filled questionnaires;
- the application should manage the requirements for data analysis and drawing conclusions along multiple dimensions, as expected, although at the certain point such application functions are not developed.

In the database structure, visualized in Fig. 1, there are 8 tables as some of them store types of different demographic data, service information about the possible answers and their values for the analysis of the

survey, operational information for each started evaluation questionnaire, the answers to the questions for each questionnaire and others.

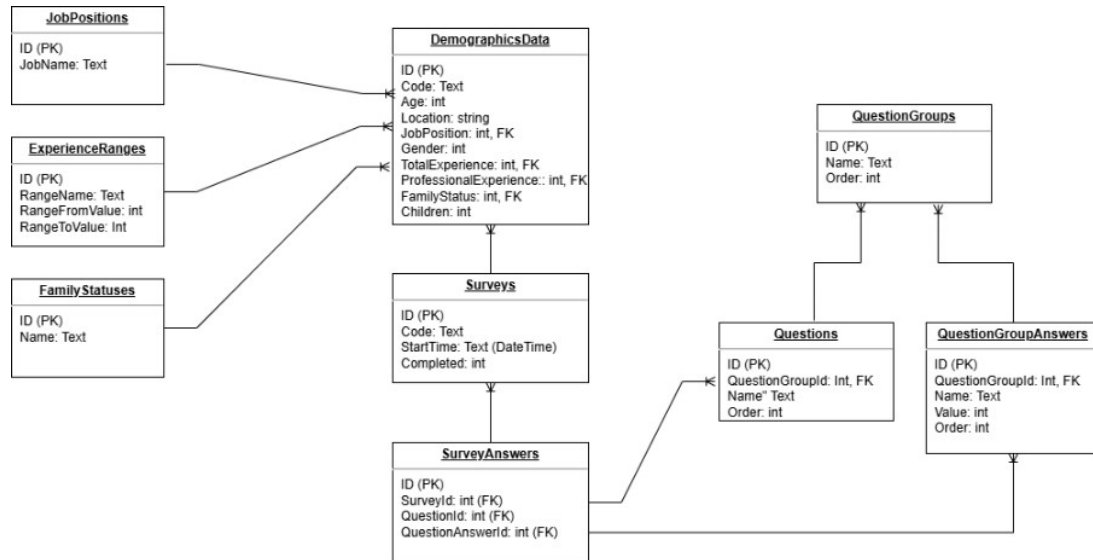


Figure 1. Database structure

The relational database management tool chosen is SQLite [4]. SQLite is a well-established open-source product that is recommended as a standard format for document storage by the US Library of Congress [5]. One of the key aspects for preferring the product are transactional presence with the full support for ACID transactions and the good prerequisites for horizontal scaling through the database sharding. Sharding involves the segmentation of data across multiple sources, with each database handling a subset of users. Fundamentally, the distribution of data across multiple databases or machines proves essential in achieving scalability and improved performance [6, 7, 8, 9].

The project is characterized by a strong preponderance of operations for creating new records in the database, without such for changing or deleting existing records. Read operations are few in number, but require reading and aggregating the entire data set. These features make the portal particularly suitable for horizontal scaling when needed and necessitate the use of database sharding.

### Content and UX adapted for specific type of users

The content and UI/UX are also key aspects for the web portal structure and provide the ability for more users to be interested in filling the

questionnaires regardless of their stress levels. The StressPortal target audience consists of potentially innerved, and stressed schoolteachers who have no motivation and very low interest in additional tools that engage their daily working lives. For that type of users, it is appropriate to provide minimum number of distracting elements, simple color palette and certain well-prepared user interface.

### **Web Content Accessibility Guidelines**

WGAG are collection of standardized recommendations for making web content more accessible, primarily for people with disabilities, but also for all regular users interacting with the corresponding web tool [10]. From the point of view of expectedly elevated stress levels ones, the guidelines can improve information process ability. We can consider several main guidelines topics that are followed while developing the user interface of the StressPortal, such as:

- Text Alternatives, Clear and Simple Page Language: Content should be understandable and written in simple language. For users under stress, content that is straightforward is easier to process. In addition, including visual alternatives of the text fields are better for data understanding and such can be seen both in the site and the Questionnaires application.
- Predictable, Consistent Navigation: Navigation elements, such as menu bar or active sections should appear in a consistent order on every page. This helps users under stress quickly find what they need without confusion.
- Input Assistance: Clearness of questions/answers, understandable labels and instructions for all user inputs reduce frustration and gives ability for the corresponding people to interact easily with the web portal.

The home page contains a navigation bar for browsing the internal views of the StressPortal. For the convenience of users, an access button linking the module for self-assessment is displayed in a central position in every page as a popup element (see Fig. 2).

The StressPortal application is accessible to pedagogical specialists in Bulgaria with @edu.mon.bg profile. Despite the login via corresponding email, the anonymity of each user is fully ensured on the backend side of

the project (see Fig. 3).

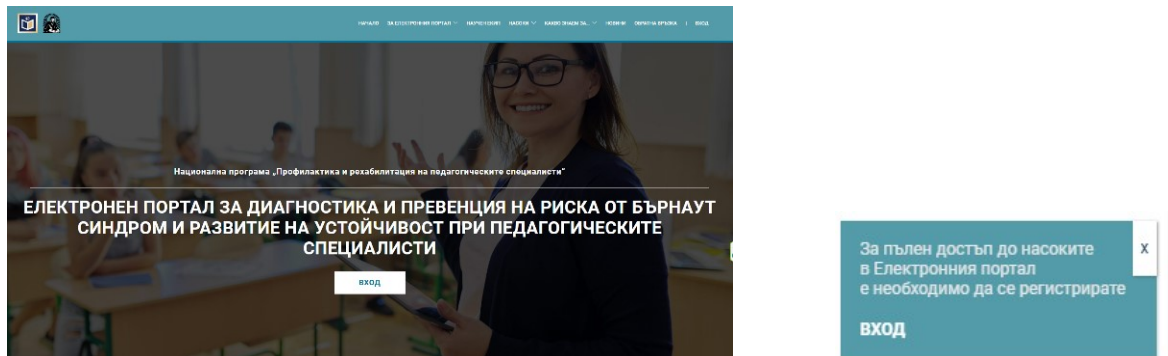


Figure 2. Home screen and popup app access

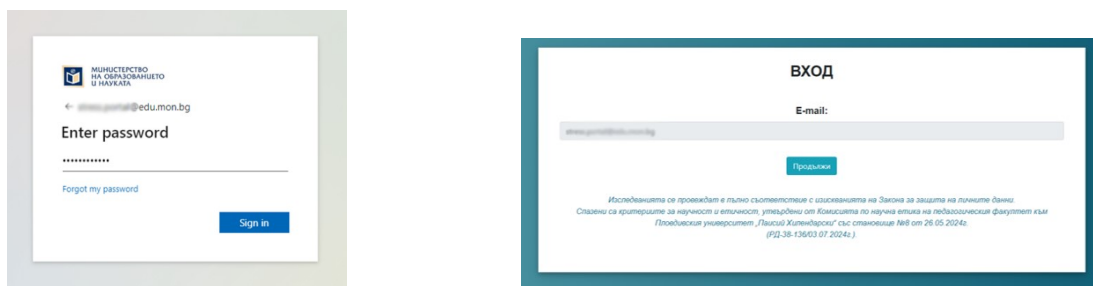


Figure 3. Sign in views from the two access points

There are two types of assessment scenarios. The first one involves a test using a graphical element. The stress thermometer allows each user to reflect their self-evaluation, which is possible both in color and through a description. He/she can select the current stress level by indicating the appropriate radio button.

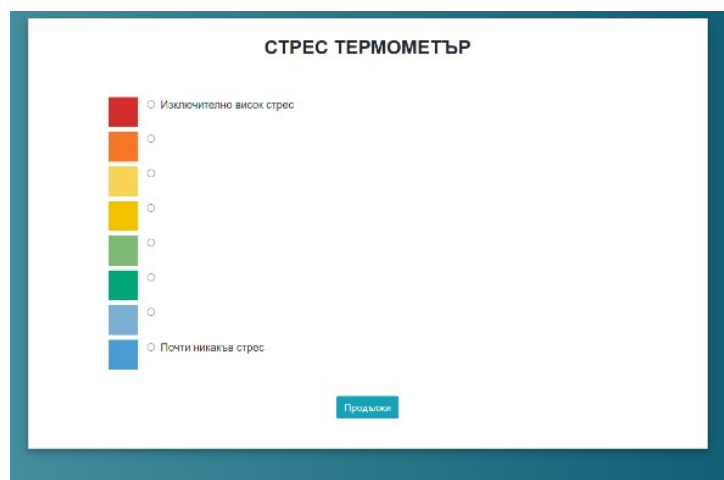


Figure 4. Stress thermometer

The second scenario demonstrates working with test questionnaires. They consist of several questions with a certain number of possible answers. The user enters his/her own, and it is necessary to select a given radio button. The vision of both the stress thermometer and the list tests remains unchanged even when accessed from a mobile device.

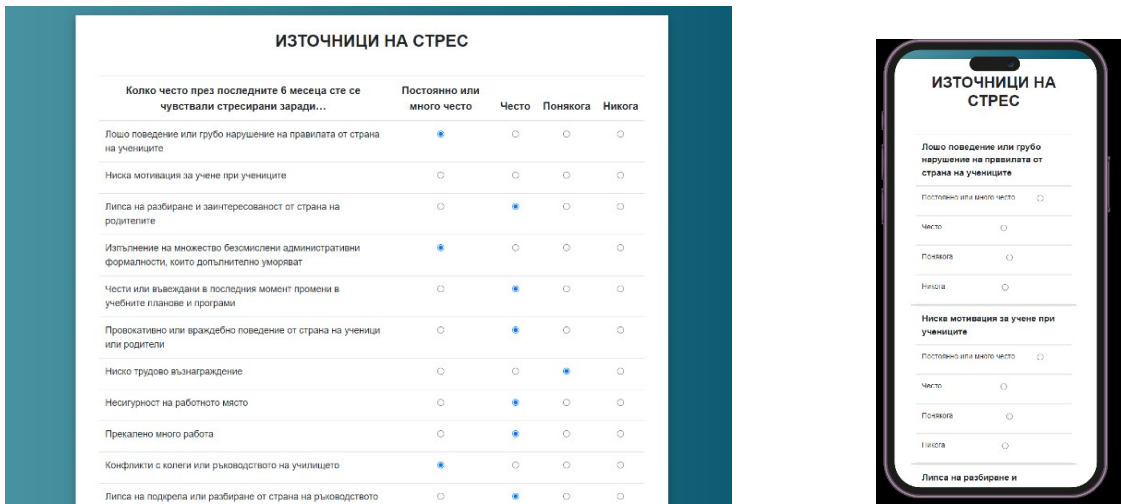


Figure 5. Adaptive design of the Questionnaires

After completing all the tests, the results are visualized on the last page. Both conclusions are drawn and individual guidelines are provided for improving daily habits, family relationships and building more successful communication for a positive educational environment. They are divided into three main topics, more about which can be found on the specialized website.

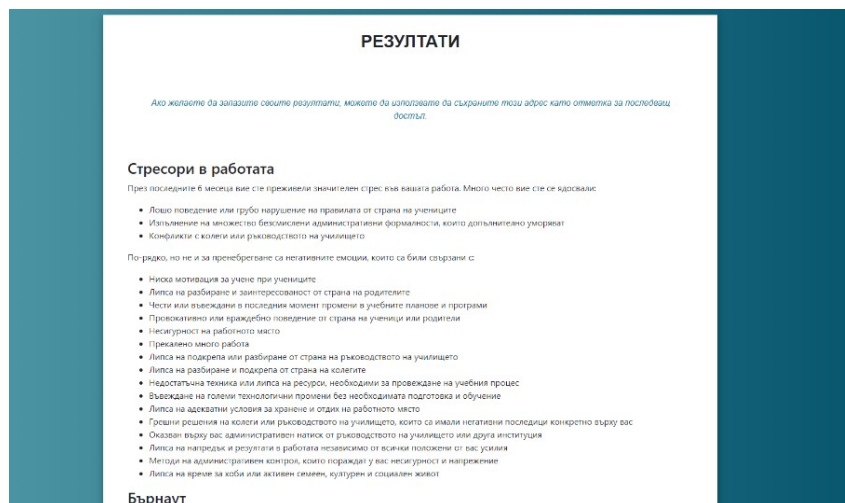


Figure 6. Personal result from the individual assessment

If the users, having received their result, wants to embrace with the exact content of the guidelines, they should select the active links pointing to the specified resources on the site. In case they prefer to save the information in order to follow the specified advice repeatedly in the future, they have the opportunity to download the entire result in a suitable format by selecting the “Download as file” button. Thanks to its simplified appearance, the downloaded resource can also be printed out.

**Психическа устойчивост**

Вие притежавате ресурси, за да се справите успешно с повечето задачи или задължения в работата и живота. Независимо от това бихте могли да развivate своята устойчивост с техники и упражнения, предложени в някои от насоките на Портала.

Упражнението „Три хубави събития“ например ще ви помогне да ориентирате мислите и емоциите от деня в положителна перспектива (Насока 7).

Безценни идеи, които биха могли да спомогнат за възстановяване на положителните взаимоотношения с ваши близки и познати, ще намерите в насоки 17 - [Благодарствено посещение](#) и 19 [Извършване на добрина](#).

Всеки път преди да се втурнете към поредния ангажимент, си давайте внимателно сметка дали силите и способностите ще ви позволят да постигнете набелязаните резултати (Насока 23).

Развийте способността си да бъдете в състояние на оптимално преживяване („поток“)! Потокът се стимулира от креативното отношение към работния процес и позитивната обратна връзка от дейността, в която намираме смисъл (Насока 26).

[Изтегли като файл](#)

\* Можете да изтеглите текущия резултат от индивидуалната ви диагностика чрез избор на бутон "Изтегли като файл".

Figure 7. Interactive navigation to stress reduction recommendations

## Results and conclusions

As per Nov 10, 2024 there are 6300 surveys made, 4160 unique users filled the questionnaires and we consider 3910 valid, complete surveys. In addition, there are 250 abandoned inquiries, but 0 partial ones. In conclusion, we can recognize that the target users have low motivation to take the survey, which is the key point of providing solutions for reducing stress levels in the pedagogical sphere. Moreover, forced authorization in the beginning, undermines the trust in the advertised anonymity. Unfortunately, after data analysis, the demographics questionnaire makes people quit. Taking into account the user experience and based to the content provided, we can consider that they well-made, due to the result that they are no partial surveys.

## Acknowledgments

The stress resilience content and the design and development of the user interface of the web portal are partially supported by National



program “Prevention and rehabilitation of pedagogical specialists” No. 128/26.06.2024.

The web portal scalable architecture is partially supported by project MUPD23-FMI-009 of the Scientific Research Fund of Paisii Hilendarski University of Plovdiv, Bulgaria.

### References

- [1] M. Ashrafuzzaman, The impact of cloud-based management information systems on hrm efficiency: an analysis of small and medium-sized enterprises (SMES), *Academic Journal on Artificial Intelligence, Machine Learning, Data Science and Management Information Systems*, Vol. 1, No. 1, 2024, pp. 40–56, <https://doi.org/10.69593/ajaimldsmis.v1i01.124>.
- [2] S. Nasab, Al. Vahid, R. Vahid, A comprehensive review of the security flaws of hashing algorithms, *Journal of Computer Virology and Hacking Techniques*, 19 (2), 2023, pp. 287–302, ISSN: 2263-8733.
- [3] <https://learn.microsoft.com/en-us/aspnet/core/release-notes/aspnetcore-8.0?view=aspnetcore-9.0>, (visited on 30/11/2024).
- [4] <https://sqlite.org/about.html>, (visited on 30/11/2024).
- [5] <https://www.loc.gov/preservation/digital/formats/fdd/fdd000461.shtml#local>, (visited on 30/11/2024).
- [6] <https://aws.amazon.com/what-is/database-sharding/>, (visited on 30/11/2024).
- [7] A. Silberschatz, H. Korth, Sh. Sudarshan, *Database system concepts*, McGraw-Hill, 2011, ISBN: 978-0078022159.
- [8] D. Knuth, *The Art of Computer Programming, Vol. 3, Sorting and Searching*, Addison-Wesley Professional, 1998, ISBN: 978-0201896855.
- [9] W. Penard, T. van Wekhoven, On the Secure Hash Algorithm Family, *Cryptography in context*, 2008, pp. 1–18, <https://shorturl.at/CUVqD>.
- [10] <https://www.w3.org/WAI/standards-guidelines/wcag/>, (visited on 30/11/2024).

Nikolay Pavlov<sup>1</sup>, Veselina Naneva<sup>2</sup>, Youri Yanakiev<sup>3</sup>,  
<sup>1,2,3</sup> Paisii Hilendarski University of Plovdiv,

13 – 15 November 2024, Pamporovo, Bulgaria

---

<sup>1,2</sup> Faculty of Mathematics and Informatics,

<sup>3</sup> Faculty of Pedagogy,

236 Bulgaria Blvd., 4027 Plovdiv, Bulgaria

Corresponding author: [nikolayp@uni-plovdiv.bg](mailto:nikolayp@uni-plovdiv.bg)