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Ihor Polataiko
Mariia Slobodian
Volodymyr Vynnyk

EDUCATION QUALITY IMPROVEMENT SYSTEM BASED ON ANONYMOUS SURVEYS

Department of Information Technology
Vasyl Stefanyk Precarpathian National University
Ivano-Frankivsk, Ukraine

Abstract
In this paper, we propose the solution to the common problem: the evaluation of the education quality in the educational institutions. The proposed solution is based upon the gathering and analyzing anonymous survey information from different stakeholder categories. The result of the analysis is used to build the graph showing the information about the satisfaction level of various categories of stakeholders. The main challenge is to provide the way of passing fully anonymous surveys with the ability to differentiate them by stakeholder categories, that the feedback is given by, and educational categories, that the feedback is given for. The software, built based on the results of this research, uses JavaScript Object Notation Web Token to pass the information regarding certain feedback session, while abstracting from the identity of the person, which leaves the feedback.
Keywords: *quality of education, feedback, software, JavaScript Object Notation Web Token.*

INTRODUCTION

Providing quality education is one of the key success factors for any educational institution. The quality of education, in large degree, can be measured as a satisfaction level of the quality of education among different categories of people, that are called stakeholders in this paper. It is one of the main characteristic of the educational institutions, which, then can be used for analysis and improvement.

The main purpose of the software, that should be built based on the results of this research, is to provide a tool for analyzing and evaluating the quality of the education, based on conducting anonymous surveys for different categories of stakeholders, which will determine strengths and weaknesses, as well as, the level of satisfaction by quality of the education, based on the feedback from the different categories of people.

The software system needs to provide the way to collect the anonymous feedback data first, while providing the ability to differentiate this data by stakeholder categories, that the feedback is given by, and educational categories, that the feedback is given for, and then, ability to generate statistics, based on the feedback, have to be provided as well.

RELATED WORK

There are a large number of works related to the problem. Reference [1] is devoted to JavaScript Object Notation Web Token (JWT), that is an Internet Engineering Task Force open standard (RFC 7519) aimed at providing a well-defined way of exchanging verified claims between two or more parties.

Paper [2] covers all major facets of survey research methodology, from selecting the sample design and the sampling frame, designing and pretesting the questionnaire, data collection, and data coding, to the thorny issues surrounding diminishing response rates, confidentiality, privacy, informed consent and other ethical issues, data weighting, and data analyses

In the [3] the studies suggest that complete anonymity may compromise measurement accuracy rather than improve it.

In the paper [4] there is a study with an experimental design used to evaluate split questionnaire design, demonstrating substantial benefits in reduction of measurement error.

The examination of the relationships between question structure, question length, wording familiarity, and response effect can be found in [5]. A randomized response method for estimating a population proportion is presented as an example in [6].

The paper [7] defines the fundamental concept of Net Promoter Score, explaining its connection to customer satisfaction surveys. In [8] is presented a six-stage process for customer satisfaction surveys.

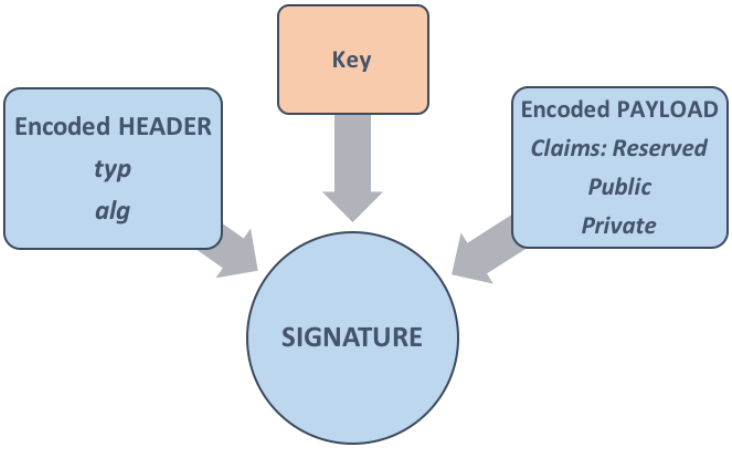
Papers [9], [10] present practical aspects in the conduct and reporting of survey research in educational projects.

METHOD

Generally, the problem consists of two parts.

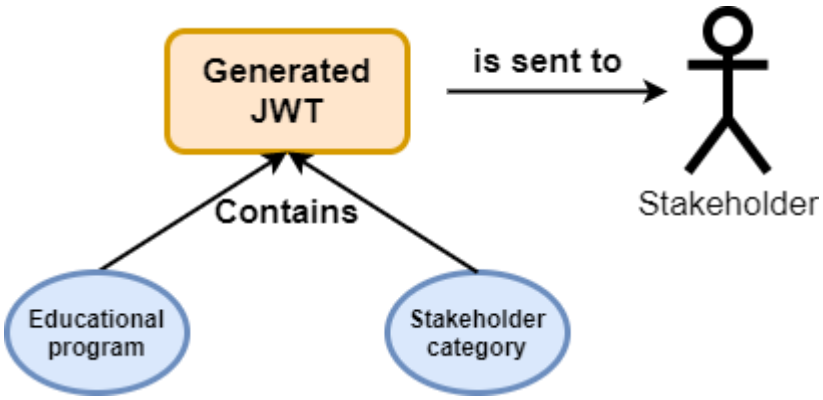
First part is stated as following: the feedback has to be fully anonymous, while, at the same time, we have to be able to differentiate them by a stakeholder category and educational category. Also, educational program, that feedback is given for, in some cases can be selected during the feedback sessions, but in others, it has to be predetermined at the time of feedback session and cannot be changed during the session itself. There was one more functional requirement to the resulting software: it had to be highly configurable, which means, the list of stakeholder categories and educational programs can be configured at any time, allowing flexible usage of the software across various educational institutions.

To resolve this problem, the JWT method of passing the information was chosen. Self-contained tokens keep all the information regarding the concreate feedback sessions, while ensuring that this information will remain unchanged.



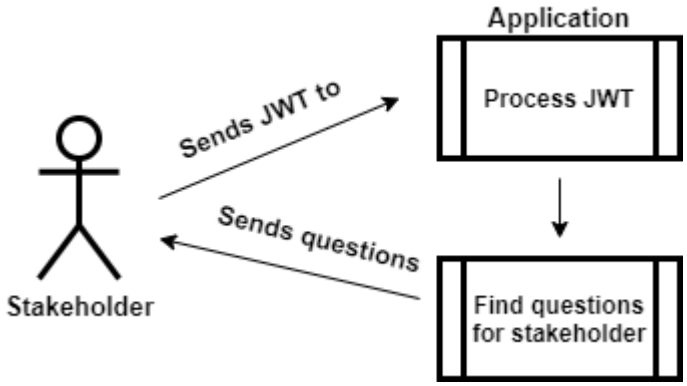
Img. 1. JWT structure

The tokens are issued by the software, when the moderator choses the properties of the concrete feedback sessions, and are appended, as a query parameter, to the URL, that points to the page for the feedback submission. Later, the URL is shared with all the people, who have to be involved in the concrete survey session and defines their session parameters, also allowing to track which stakeholder category these people represent.



Img. 2. Sharing JWT with stakeholders

Based on the stakeholder category that person represents, questions regarding the same topic, will be formulated in different ways, allowing to gather the most relevant feedback. Symmetric encryption was chosen as the one, that is applicable for this problem, based on the fact, that the issuer and the validator of the token is the same software.



Img. 3. Sending questions to stakeholder

The second part of the problem is calculation of satisfaction score using the data gathered. There are different ways to calculate satisfaction statistics, based on the survey results. The most primitive method is just a calculation of the average score of corresponding subset of the feedback. Other methods that is used for statistics calculation are Customer Satisfaction Score (CSAT score), calculated as a number of positive answers divided by a total number of all answers, and Net Promoter Score (NPS), calculated as a number of positive feedback minus a number of negative feedback.

Img. 4. Customer Satisfaction Score

RESULTS AND CONCLUSION

As the outcome of the performed research, the solution of the stated problem was developed. Usage of self-contained JWT token for passing an unmodifiable information is the suitable approach for solving the problem of passing the feedback session parameters as the way to pass unmodifiable, fully transparent information, that can be read by anyone, but cannot be changed by the parties, that does not own a secret key.

Based on the gathered survey information, we are able to perform different data aggregations to calculate different types of satisfaction scores, providing the relevant statistics, that will allow educational institutions to see the level of the satisfaction by some educational program among the different categories of the stakeholders.

The software should be one of the contribution factors to the improvement in the field of education.

REFERENCES

1. Sebastian Peyrott. JWT Handbook: Auth0 Inc., 2017, pp. 118.
2. Paul J. Lavrakas, “Encyclopedia of Survey Research Methods", 2008, doi:http://dx.doi.org/10.4135/9781412963947.n19.
3. Yphtach Lelkes, Jon A. Krosnick, David M. Marx, Charles M. Judd and Bernadette Park “Complete Anonymity Compromises the Accuracy of Self-Reports”, September 2011, pp. 18-22.
4. Backor, K., Golde, S., & Nie, N. (2007). Estimating Survey Fatigue in Time Use Study. Paper presented at the 2007 International Association for Time Use Research Conference, Washington, D.C.
5. Bradburn, N. M., Sudman, S., Blair, E., & Stocking, C. (1978). Question threat and response bias. Public Opinion Quarterly, 42, 221-234.
6. Warner, S. L. (1965). Randomized response: A survey technique for eliminating evasive answer bias. Journal of American Statistical Association, 60, 63-69.
7. Fred Reichheld(author) and Rob Markey(contributor), “The Ultimate Question 2.0 (Revised and Expanded Edition): How Net Promoter Companies Thrive in a Customer-Driven World”, September 20 2011.
8. Nick Hague and Paul Hague, “Customer Satisfaction Surveys and Research: How to Measure CSAT”.
9. H. Akerlund, G. Audemard, H. Bollaert, V. Hayenne-Cuvillon, A. Hlobaz, M. Kozlenko, P. Milczarski, J.C. Monteiro, J. Morais, D. O'Reilly, P. Possemiers, Z. Stawska (2020) Project GGULIVRR: generic game for ubiquitous learning in interactive virtual and real realities, EDULEARN20 Proceedings, pp. 5973-5979.
10. Dutchak M., Kozlenko M., Lazarovych I., Lazarovych N., Pikuliak M., Savka I. (2021) Methods and Software Tools for Automated Synthesis of Adaptive Learning Trajectory in Intelligent Online Learning Management Systems. In: Ben Ahmed M., Rakıp Karaş İ., Santos D., Sergeyeva O., Boudhir A.A. (eds) Innovations in Smart Cities Applications Volume 4. SCA 2020. Lecture Notes in Networks and Systems, vol 183. Springer, Cham. https://doi.org/10.1007/978-3-030-66840-2_16.
11. I. Polataiko, M. Slobodian, and V. Vynnyk, "Anonymous survey system for quality assurance in education," in Proceedings of the 2019 Scientific Seminar on Innovative Solutions in Software Engineering, Ivano-Frankivsk, Ukraine, Dec. 10, 2019, pp. 28-30, doi: 10.5281/zenodo.4516556.

Ihor Polataiko *– IPZ-41, Faculty of Mathematics and Computer Science.*
Mariia Slobodian *– IPZ-41, Faculty of Mathematics and Computer Science.*
Volodymyr Vynnyk *– IPZ-41, Faculty of Mathematics and Computer Science.*

Supervisor: ***Ihor Lazarovych*** *–Associate Professor of Computer and Software Engineering, Vasyl Stefanyk Precarpathian National University, Ivano-Frankivsk.*