

André Sekulla, Jiannis Giatagantzidis, Julian Dax, Volkmar Pipek (2019): A Lightweight Tool for Measuring the Impact of IT Security Controls in Critical Infrastructures. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_p03

A Lightweight Tool for Measuring the Impact of IT Security Controls in Critical Infrastructures

André Sekulla, Jiannis Giatagantzidis, Julian Dax, Volkmar Pipek
University of Siegen
{forename.surname@uni-siegen.de}

Abstract. IT security is a cost-intensive aspect of SMEs. Critical infrastructures, in particular, are increasingly dependent on good IT security. Increasing security, however, can limit the usability of existing applications and work processes. Based on empirical studies inclusive workshops in the field, we designed a lightweight tool and integrated it into an inter-organizational knowledge exchange platform. With the tool, we want to offer an opportunity to get experience and feedback directly from those employees, who are directly affected by IT security controls. So, the IT security officer can react to it and gain more insight into the impact of IT security controls. They are in the position to administrate the tool's backend company-internally, while chosen data can be exported and discussed on the inter-organizational platform. Hence, this tool supports a community building effect on organizational and inter-organizational level.

Introduction

Due to the legal situation in Germany, critical infrastructures are obliged to introduce an Information Security Management System (ISMS). This raises possible problems, especially for small and medium-sized enterprises. The problems of SMEs caused by the advancing digitalization and Industry 4.0 are already a topic of the CSCW Community (Ludwig et al. 2018). With the use of an

Copyright 2019 held by Authors, DOI: 10.18420/ecscw2019_p03

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers, or to redistribute to lists, contact the Authors.

ISMS, IT security controls are introduced in the respective company, which can have a direct influence on the (work-) processes of the company. Restrictions resulting from IT security potentially reduce usability and user experience. Furthermore, many SMEs lack the capacities to guarantee IT security in the best possible way. With the demonstrator presented in this paper, we would like to present a lightweight tool that measures the influences of IT security on employees and (work-) processes and additionally supports an exchange of knowledge and experience between SMEs.

Description, Requirements, and Concept

In the following part of the paper, we want to give a brief description of the lightweight feedback tool. Furthermore, through our research, we could define requirements and develop a concept for integrating this tool into an already created inter-organizational knowledge exchange platform, the core of our research project (Dax et al. 2016, Schmitz et al. 2018).

Description. With the demonstrator presented here, the IT security manager or administrator of the ISMS should be able to receive feedback on the IT security controls introduced in the organization. In this context, there are two views within the lightweight tool. One for the administrator, for the introduction of new controls (including a detailed description) and matching surveys (pre-defined questions and individual questions possible). Employees of the company or end users of the tool can view the controls, give direct feedback with the help of a comment function or have discussions with other users and the administrator or give feedback by completing the listed survey(s). In particular, the comment function is intended to support an exchange of experience between employees, but also to improve IT security throughout the company. An example scenario is that an employee could give direct feedback on a security control through a browser to access the web-based tool on his or her computer or smartphone.

Requirements. Before the development of the demonstrator, an empirical study was carried out. Among other things, workshops with four different energy supply network operators and two large-scale surveys between approx. 900 SME energy supply network operators in Germany could be carried out (Dax et al. 2017, Pape et al. 2018). These requirements can be derived from the findings:

- (1) May not disturb the daily work of employees: Easy and simple usability.
- (2) Dealing with sensitive data: No automated data exchange beyond the company's network.
- (3) Exchange of experiences: Between employees, as well as an inter-organizational exchange between the respective IT security officers.

Concept. Based on the requirements we designed a concept for integrating the lightweight usability feedback tool into the core platform of our research project. The resulting concept is shown in figure 1 and figure 2.

For providing a solution to the first requirement, the lightweight feedback tool should be available through a mobile device but also on a personal computer by the employees or end-users (see figure 1).

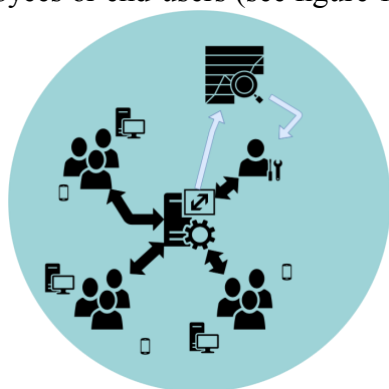


Figure 1. Concept of the feedback tool in one company. Accessible through smartphone and personal computer. Self-hosted web-platform controlled by the IT security officer.





Figure 2. Concept of the feedback tool included in the inter-organizational knowledge exchange platform. IT security officers can choose and exchange specific feedback data.

The second and third requirement can be provided by the integration of the lightweight feedback tool into the already developed inter-organizational web-based platform of our research project. As it can be seen in figure 2, the platform can be accessed on the internet, while the lightweight feedback tool has its own structure based on a self-hosted service internally at the company's private network and server. Hence, the generated feedback data and sensitive data is secure. The IT security officer can provide chosen data from it, through a csv-/json-export function, onto the inter-organizational platform and discuss it with other company's IT security officers or administrators.

Lightweight Feedback Tool & Community Building

Based on the requirements and concept, we designed a lightweight tool for feedback on IT security controls introduced in a company. To provide access via a mobile device and personal computer, we developed a standalone responsive web-application with the React.js framework. The resulting tool has two views with different functionalities as described in table 1.

Table 1. Table of functions, functions are separated by user role.

Function Views	Adding new control entry	Create a survey	Start/Close survey	View results	Export results	Create a comment	Answering a survey
IT security officer 	X	X	X	X	X	X	X
Employee 	-	-	-	X	-	X	X

The admin can choose from many existing IT security controls, with a detailed description, or define an individual control to generate a new entry. Furthermore, a predefined survey is automatically added to this control. The admin can also add new and individual questions to the survey. For supporting an experience exchange and discussion on this platform of the feedback tool, it is possible to create comments under a control entry or another comment – this should open the opportunity to discuss different topics related to one IT security control. Hence, a community building effect between the end-users and the admin is supported. While IT security is expensive and, as already said, SMEs in most cases do not have enough capacities, an organizational community with awareness for IT security can create added value for the whole company. Furthermore, the admins can export their experiences and share them on the inter-organizational exchange platform, for an inter-organizational community building effect. This community consists of IT security experts and managers from different critical infrastructures or SMEs. So, the experience and knowledge can be spread and discussed, resulting in an improvement of the security on an organizational level.

Acknowledgment

Many thanks to Leon Rische and Florian Becker for their cooperation. The tool was developed within the research project SIDATE, which is funded by the “Bundesministerium für Bildung und Forschung” (BMBF) within the funding focus “IT Security for Critical Infrastructures”. Funding number: 16KIS0239K.

References

- Dax, J., Ley, B., Pape, S., Schmitz, C., Pipek, V. and Rannenber, K. (2016): ‘Elicitation of Requirements for an inter-organizational Platform to Support Security Management Decisions’, *Human Aspects of Information Security & Assurance (HAISA)*.
- Dax, J., Ley, B., Pape, S., Pipek, V., Rannenber, K., Schmitz, C., Sekulla, A. (2017). ‘Stand zur IT-Sicherheit deutscher Stromnetzbetreiber : technischer Report’, Technical Report, <http://dokumentix.ub.uni-siegen.de/opus/volltexte/2017/1185>, Universität Siegen.
- Ludwig, T., Kotthaus, C., Stein, M., Pipek, V. and Wulf, V. (2018): ‘Revive Old Discussions! Socio- technical Challenges for Small and Medium Enterprises within Industry 4.0’, *Proceedings of 16th European Conference on Computer-Supported Cooperative Work - Exploratory Papers, Reports of the European Society for Socially Embedded Technologies* (ISSN 2510-2591), DOI: 10.18420/ecscw2018_15
- Pape, S., Pipek, V., Rannenber, K., Schmitz, C., Sekulla, A., Terhaag, F. (2018). ‘Stand zur IT-Sicherheit deutscher Stromnetzbetreiber, November 2018 : technischer Report’, Technical Report, <http://dokumentix.ub.uni-siegen.de/opus/volltexte/2018/1394/>, Universität Siegen.
- Schmitz, C., Sekulla, A., Pape, S., Pipek, V. and Rannenber, K. (2018): ‘Easing the Burden of Security Self-Assessments’, *Human Aspects of Information Security & Assurance (HAISA)*.