Adaptable GDPR Assessment Tool for Micro and Small Enterprises

Emanuel Löffler[a], Bettina Schneider[b], Andreas Goerre and Petra Maria Asprion[c]
[1]*Institute for Information Systems, School of Business, FHNW University of Applied Sciences and Arts Northwestern Switzerland, Peter Merian-Strasse 86, Basel, Switzerland*

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Abstract: The coming into force of the European General Data Protection Regulation (GDPR) has profoundly changed the data protection landscape. Irrespective of their size, organisations inside and outside of Europe are challenged to comply with the requirements posed by the GDPR. Especially micro and small enterprises (MSEs) lack the required internal resources and knowledge to understand the regulation and its implications. In our study, a simplified self-assessment tool dedicated to the situation of MSEs is designed to act as an amplifier for the data protection maturity of this target group. Our research is embedded into the H2020 EU project GEIGER that aims to leverage cybersecurity and data protection of MSEs in Europe. Building upon Hevner's design science research, our study results in an open source, easy-to-adapt GDPR self-assessment web application targeted to the broad, but so-far rather neglected user group of MSEs. Our privacy-by-design and mobile-first approach ensures the trustworthy handling of user data while focusing on usability.

1 INTRODUCTION

In recent years, the global IT landscape has undergone a revolution in terms of the processing of personal data. The Cambridge Analytica scandal put data protection in the spotlight, highlighting the need for stronger data protection laws (Davies, 2015). Consequently, the European Union (EU) reacted with a new data protection regulation in 2016; after a two years transitional period, the General Data Protection Regulation (GDPR) came into effect (Voigt & Von dem Bussche, 2017). The protection of personal data is now a fundamental right of every EU citizen.

The data protection legislation in countries that are not part of the EU, such as Switzerland, are often based on the principles of GDPR (European Commission, 2020a). The aim of GDPR is to strengthen the rights of the individuals over their own data, to make organizations accountable, and to provide services without barriers − irrespective where the individuals or services are located (Tikkinen-Piri, Rohunen & Markkula, 2018).

GDPR applies to organisations of any size that process personal identifiable data from EU citizens (Voigt & Von dem Bussche, 2017). However, the regulation is written in legal language and is full of technical terms. Especially micro and small enterprises (MSEs), which are essential for the European economy (European Commission, 2020b), struggle to understand how they can comply with the regulation and what it means for their business (GDPR.EU, 2019). This is a severe issue since fines as consequence of non-compliance are harsh and every EU citizen can file a lawsuit in case of a GDPR violation (Voigt & Von dem Bussche, 2017).

The EU-funded project GEIGER[1] aims to help MSEs coping with the risks that are coming with the ongoing digitalization. One of the project's targets is to develop a so-called 'GEIGER Indicator', which shows the current cybersecurity and privacy risks and allows the user to take simple countermeasures. In alignment with the classification published by the European Union Agency for Cybersecurity (ENISA, 2021), the GEIGER project covers the main cybersecurity threats; data protection and GDPR

[a] https://orcid.org/0000-0001-9469-5146
[b] https://orcid.org/0000-0001-8460-3658
[c] https://orcid.org/0000-0001-6582-5087
[1] https://project.cyber-geiger.eu

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compliance are regarded as an essential aspect. The present study is embedded in the GEIGER research.

The challenge of MSEs to achieve GDPR compliance is well known and documented (Schweizerischer KMU Verband, 2020; GDPR.EU, 2019). As this target group is large and shows an immense diversity, tailored support is still a need. To help MSEs to be compliant with GDPR, self-assessment tools have been created helping to conduct an initial positioning. Nevertheless, many enterprises do not know where to start and how to identify the crucial parts of the regulation for their business. They are overwhelmed by the complexity of the procedures to assess data protection maturity. One significant cause can be found in the fact that the existing self-assessment tools are written using formal language and technical terms. There is a lack of fit for the target group of MSEs.

To close this gap, an easy-to-use and easy-to-understand ´GDPR self-assessment tool´ dedicated to MSEs could simplify the path to compliance and to foster a positive perception of data protection. The challenge is to find the balance between simplicity and informative value. With our research to design and develop an adaptable GDPR self-assessment web application, we aim to contribute to the data protection journey of MSEs.

As methodological approach, design science research (DSR) has been used. The approach intends to attain expertise and comprehension of a problem domain, as well as its solution in the development and application of an artifact (Hevner et al., 2004). The target of DSR is to support research that is close to the environment, in which a problem should be solved; thus, it should be a applied-oriented approach. The environment is examined to identify a problem, which results in business needs for the artifact. The knowledge base is examined to extract foundations and methodologies of prior research to end up with applicable knowledge for the development of the artifact. After creating a prototype, the artifact needs to be evaluated and refined based on the insights of the environment and knowledge base. Once the artifact is set for field testing, it is applied in the environment. As soon as the research provides new findings, extensions of the knowledge base can be provided. At the end of the research, the findings need to be communicated in an appropriate way (Hevner et al., 2004).

Our research follows the suggested steps of the DSR process. First, the problem identification is completed through research on GDPR and MSEs in Europe; it is enhanced through an expert interview with the managing director of a data protection advisory firm operating in Germany. Based on the analysis of existing work (section 2), the goals the artifact is intended to achieve are defined applying the principles of the Kano model (Matzler et al., 1996). Next, the GDPR self-assessment web application is designed and developed using a ´mobile-first´ approach (section 3). The prototype is tested in an appropriate environment (section 4). The evaluation is based on prior defined requirements and insights of the demonstration phase. It ends with conclusions and an outlook (section 5).

2 EXISTING WORK

Various GDPR self-assessment tools exist and are suitable for different target groups. Three solutions – (1) a professional self-assessment by the British Information Commissioner Office (ICO), (2) a more playful self-assessment provided by the Bavarian data protection body BayLDA, and (3) an Online Check from a Swiss national federation − have been selected to be elaborated in more detail. They have been chosen as they are published by data protection authorities (DPAs) that offer rich guidance for MSEs and must adhere high content quality standards. Moreover, they were complementary regarding their design, allowing for a juxtaposition of these approaches as a canvas for the development of our MSE-oriented artifact. The descriptions of the tools are followed by an assessment identifying potential gaps and building the base for the objectives of our newly created self-assessment web application.

2.1 British ICO

The British ICO provides an extensive repository of GDPR-related resources for a spectrum of users[2]. A set of checklists aimed at MSEs offers a collection of tools for the measurement of GDPR compliance. It consists of eight questionnaires tailored to the following various fields of activity. Our focus lay on a tool dedicated for MSEs and sole traders.

The questionnaire opens with a short description of the tool's focus and hints towards an initial assessment to see if GDPR applies to the organisation. From there, a set of nine short questions leads the participant to answer with the predefined

[2] Even though Brexit has changed the relationship to the EU, the material is still valid.

answers – 'Yes', 'No' and 'In Part'. The option 'Yes' is preselected for all questions. Upon submission, the participant will be provided with an overview of the answers and additional details (suggested actions and further readings). The results can be downloaded for documentation, which suggests data processing on the server side. However, there is no dedicated information on whether the data that was entered is retained or utilized by the ICO.

Assessment: The GDPR self-assessment for small businesses and sole traders by the ICO is strong in terms of content. The questions are covering the relevant aspects of GDPR; the additional information, the suggested actions and the further readings provide informational value. Yet, there are some areas for improvement. First, the questionnaire requires prior knowledge. Second, the self-assessment could be more engaging. In terms of the user interface, the questionnaire is well-structured but does not have any element or effect which would raise the user's attention. Third, it could be an issue that all the radio buttons are pre-ticked for the answer 'Yes'. By one single click on the 'submit'-button, the self-assessment can be finished, whereas the user will not benefit from recommended actions.

2.2 BayLDA Road to GDPR

The DPA of the German federal state of Bavaria provides a self-assessment tool for any size of business based on a set of 28 questions (BayLDA, n.d.). The tool is available in German and English language. The single-choice answers are not limited to 'Yes'/'No' but provide three elaborated options to choose from. This requires the users to think about the questions deeply and to get an impression of GDPR's intentions. The questions are subdivided into five categories of varying value for the final evaluation. The category of 'privacy engineering' is prioritized, which suggests an implicit target group of larger enterprises with a complex interplay of systems and processes.

The tool is decorated with maps of EU member states without further connection to the context. A progress bar is displayed as a 'distance' on the figurative 'Road to GDPR' that shows how much of the assessment has already been completed. This lends the tool a feeling of playing a game.

Assessment: Similarly to ICO, the tool is strong in terms of content. The BayLDA's self-assessment uses the concept of gamification. The 'Journey through Europe'-theme emphasises the playful approach. Overall, this is contributing to a pleasant user experience and is strengthening the learning effect. The varying answers encourage the user to reflect more in detail and decide on its enterprise's response to the newly found compliance requirements. However, the questions are challenging. Unexperienced users may get frustrated by the complexity of the questions. This is a risk for the value of the assessment, as interrupted sessions will not end with the result page.

2.3 Economiesuisse Online Check

Economiesuisse is a national federation representing the interests of the mainly MSE-based Swiss business community. It serves as a link between politics, business, and society. The Federal Data Protection and Information Commissioner of Switzerland (short: EDÖB) recommends the Online Check by Economiesuisse (EDÖB, 2020).

The Online Check is accessible via a public website and organized as a questionnaire based on ´surveymonkey´ (economiesuisse, n.d.). The tool consists of two parts. As Switzerland is not part of the European Union, it starts with an assessment of the applicability of GDPR. The second part of the tool provides the main assessment. It contains 15 questions addressing both technical and organizational aspects. The technical questions revolve around systems, applications, and services used for data processing. From organizational the side, aspects such as access rights, policies, controls, or third-party contracts are focussed. Some questions are comprehensive and require prior knowledge. Regarding the tool handling, the assessment is organized using closed questions with 'Yes', 'No', or 'In Part' as options. Every question requires a reply before the test can be finished. At the beginning, the estimated time for completing the test is indicated and the progress on completing is displayed. The test results in a summary statement and a displayed percentage of achieved points. The questions and answers can also be reviewed by the user.

Assessment: The content of the Online Check is well adapted to the needs of Swiss businesses. Only once the applicability is confirmed, the main assessment starts. The 15 main questions address a broad range of GDPR topics, are however not categorized and do not refer to any articles or further information. Even though the majority of questions are formulated using simple terms, pre-knowledge is required. The conciseness and short duration are strengths fitting well to the scarce resources of MSEs. However, the result does not provide a clear guidance as it lacks appropriate recommendations. The handling of the web questionnaire could be improved as it requires pop-ups to be allowed.

2.4 Summary of Existing Tools

In summary, two of the three analysed tools (ICO and BayLDA) are geared towards fully assessing compliance, and to this aim to include most aspects of GDPR, leading to a potentially overwhelming experience for users without prior knowledge on the regulation. The third analysed tool offered a short questionnaire to be completed within few minutes. Yet, the applicability of the assessment results is rather limited. The tool provided by Economiesuisse is a counterweight to this in providing a small number of answers that can be quickly assessed. However, it exposes some technical issues in requiring browser pop-up permissions and the results provided to users contain no actionable steps.

The target group of this study are MSEs in Europe that do not possess in-house data protection expertise. Rather, we want to reach lay people. Our goal is an encouragement to take the first steps towards GDPR. Hence our design approach focusses on accessible language, to avoid discouragement through overwhelming language, and on a short completion time and actionable take-away message for the users. The previously assessed tools either have drawbacks in being too extensive for hesitant users or they lack guidance for future steps after the initial assessment. Our tool aims at filling the gap between these two approaches.

3 GEIGER MSE GDPR SELF-ASSESSMENT TOOL

The goal of our to be developed application is to offer MSEs a free-of-cost tool to assess their data protection maturity level with little/no prior knowledge. The target audience are mainly MSEs, as large businesses may want more detailed resources to provide immediate insight into the full scope of the regulation. Referring to the GEIGER project, we are targeting a 'general MSE-related data protection behaviour' competence level. This means a general set of business-related data protection issues, relevant for data protection laymen is to be addressed (Remmele and Peichl, 2021).

3.1 Requirements Definition

Our solution must fulfil ten requirements releasable as self-assessment without further guidance. The requirements were derived from an analysis of existing work and an expert interview. Each of the requirements belong to a specific topic and category corresponding to the Kano Model (Matzler et al., 1996). The different categories are 'Must-Be' (M), 'One-Dimensional' (O) and 'Attractive' (A):

1. The user shall be able to adapt the content of the web application easy. (Maintenance/M).
2. The web application shall not store any personal data about the user on the server by design. (Data Privacy/M).
3. The web application shall be built in a way that allows simple hosting (Hosting/M).
4. The user shall be able to conduct the assessment on multiple device types (User Experience/O).
5. The user shall be able to conduct the self-assessment with little to no prior knowledge (User Experience/O).
6. The user shall receive an evaluated overall result corresponding to the answers given (User Experience/O).
7. The user shall receive feedback on which aspects of data protection they could improve (User Experience/O).
8. The user shall be provided with feasible quick actions for improving the data protection maturity level of the company (User Experience/O).
9. The user shall be visually pleased by the web application (User Experience/A).
10. The user shall be provided useful links to learn about data protection (User Experience/A).

Data privacy is required due to both the sensitive nature of information that is to be entered into the tool and as a support to the credibility of a tool that advocates for minimized data collection.

Hosting (the provision of the assessment files to the user) was defined to be offline-first, thus no server that processes data outside the user's device is allowed for the application to work.

User experience is a key factor on whether the target group is interested in using the web application. This aspect is elaborated in more detail in the next section.

3.2 Design Choices

User experience is defined as "user's perceptions and responses that result from the use and/or anticipated use of a system, a product or service" (ISO, 2018). As this is a broad definition, it is worth noting the possible options to improve the user experience of the web application. Apart from basic factors like the

availability of the web application, the user experience is strongly influenced through the web application's content and user interface (Smith, 2017). Since the content should be easily adaptable and might hence be subject to change, the development of a well-designed user interface became important. The user interface of the web application is shown in figure 1.

The user interface must be easy to use with control elements that are suitable for multiple devices (i.e., smartphone, tablet, notebook, and desktop). A mobile-first approach was chosen for the development of the prototype, desktop usability (e.g. text width) was adjusted after the initial design. To adjust the look – mainly increasing the size of the different elements – for notebook and desktop screens, CSS media queries are used. The colour scheme is derived from the style guide of the GEIGER project, yet slightly adjusted to match the overall look of the web application. The content is placed in white boxes to achieve a solid visual structure, while the background of the web application is dark. The colour blue is mainly used to highlight user interactions (e.g., click on a checkbox or click on a dropdown item).

The web application consists of three different pages (i.e., landing page, assessment, and result). The landing page welcomes the user, delivers basic information, and provides a button to start the assessment. The assessment can be conducted on the second page. The assessment page starts with a header before each question is displayed. Every question is placed in its own section to improve the structure of the page. There are four answer options for each question (i.e., 'Yes', 'No', 'In Part', 'Unknown'), which restricts the application in its existing form to closed questions for the assessment.

As the target group of the web application is expected to have little or no prior knowledge about data protection and GDPR, the provision of additional information is crucial to deliver a value-adding web application. This is achieved through a dropdown element, which expands on click to display additional information. The dropdown offers three different sections (i.e., more information, case example, GDPR article), which can be filled with content matching each question. The questions are created dynamically, depending on the number of questions the administrator wants to use for the assessment. Therefore, it is important that they are structured in a uniform way. Once all the questions are answered by the user, the assessment can be evaluated by a click on the 'Evaluate'-button at the bottom of the page. If a question is left unanswered, an alert informs the user that the questions are not yet ready for evaluation. The unanswered questions are highlighted, and the user can complete the assessment.

Figure 1: Screenshot of the final page of the app.

As soon as the assessment is completed correctly (i.e., one answer per question), the user will be redirected to the final page, which displays the achieved result. The first section displays the overall rating. The second section displays a graphic, which shows the need for action of the user according to the given answers with three possible states (i.e., little need for action, moderate need for action, strong need for action), followed by a small text and an explanation of the different zones of the graphic. Depending on the answers, the user should be provided with aspects to improve on and feasible quick actions. To achieve a consistent look-and-feel throughout the web application, the same dropdown components as for the additional information in the question section have been used. Each dropdown contains a text and a link, which can be adjusted by the administrator of the web application. An appealing user interface is only the basis for a pleasant user experience (Smith, 2017). The value of the web application for its target group strongly depends on the content. Nevertheless, the developed user interface of the web application is providing the administrator with a lot of options to place content in a convenient way.

The interface components were selected in a certain amount of alignment with the ICO-tool approach. Specifically, the concept of providing simple 'Yes'/'No' and 'In Part'-answers allowed for a faster but complete run-through of the tool while providing additional information as needed through expandable fields with descriptions and examples. Learning from the ICO self-assessment, no pre-selection of an answer was made, enforcing an active interaction with each question before the user can proceed to the results page.

3.3 Development Process

The first step of the development process was the selection of fundamental technologies, i.e., programming languages and environments. With a smartphone-oriented perspective but universal executability in mind, a web-based approach was suitable. The subsequent development process was conducted in three phases.

3.3.1 Applied Technologies

For the development of the web application, a set of technologies was chosen. Basic programming languages were in part extended with libraries, predefined collections of programming functions that reduce work effort for programmers. The content structure of the app was developed in HTML. The user interface design that styles HTML documents was added with the default language CSS, under the inclusion of two libraries: Bootstrap and MDB. Functionality was implemented in JavaScript, extended with the jQuery library. All libraries are included with the tool to avoid third-party tracking. Content data is stored in the JSON format which can be edited without programming knowledge. These well-established technologies allow compatibility with most common end-user systems by means of a web browser. Furthermore, all data processing is done in the browser, thus keeping all data entered into the app confidentially stored on the end-user device.

During the development phase, emphasis was placed on allowing subsequent enhancement and modification by research staff not belonging to the original project group. To facilitate modification and development of the application, its components were documented in detail. For content editors, the data structure was programmed in a way to allow modifications without programming knowledge.

3.3.2 Development Process

In the development phase, for the questionnaire design, a set of four possible answers on any question was predefined ('Yes', 'No', 'In Part', 'Unkown'). These options were chosen to give users a fast way of providing answers, as opposed to the verbose approach of the BayLDA tool. A first set of questions was derived from the ICO assessment tool for testing. Short feedback from an expert interview was included in form of two additional fields for each question.
Two methods for determining the self-assessment score were developed. They can be chosen as an option by the maintainer providing the application by means of a dedicated configuration file. One method calculates a percentage of correct answers and does not punish negative answers, resulting in a range between 0% and 100%. In the second method, negative answers are penalized with a point deduction and rated with a score that can reach the negative range. In a subsequent development cycle, non-essential functionality was added, such as the dynamic loading of questions from the content file to facilitate changes on the self-assessment questions. Most importantly, the interface was adapted to be displayed in a well-readable manner on wide screens, which were initially neglected in the mobile-first approach. While on phones, paragraphs were wrapped due to a narrow screen, this behaviour had to be enforced on wide screens that would otherwise show very long text lines and empty space, giving the app an unfinished look. The final tool is available through a website operated by the GEIGER project[3].

4 EVALUATION

4.1 Technical Evaluation

Functionality and the user interface of the prototype were continuously tested during the development process using Google Chrome (V 91.0.4472.124). At the end, the web application was tested on other browsers: Microsoft Edge (V 91.0.864.67) and Mozilla Firefox (V 90.0). Mobile screens were simulated with Chrome developer tools were used to test the user interface on different screens of mobile devices. At the time of the technical evaluation phase, no issues became apparent.

[3] https://community.cyber-geiger.eu/games/GDPRcheck/

4.2 Field Test

Field tests are necessary to gain data about the acceptance of a prototype. A qualitative approach with selected test subjects was chosen and five questions were tested to lay focus on the user interaction. The assessment questions were formulated in a more colloquial style. The following questions were selected for field testing:

1. Do you treat personal data as a good that you borrowed rather than a good that you own?
2. Do your processing activities which involve personal data have a basis on GDPR?
3. Are you transparent towards your data subjects about processing activities which include their personal data?
4. Do you delete personal data at the end of the processing activity for which the data has been used?
5. Do you have processes in place which ensure that personal data is stored securely, both hard copies and digital data?

The field tests with the application were conducted in physical presence. The participants gave feedback while conducting the test and were able to ask questions if something was unclear. An online survey was set up for anonymized feedback. After the field tests were conducted, a qualitative analysis to figure out the key findings of the test ensued.

To achieve valuable and accurate results, it was paramount to find test subjects that own or are planning to own a MSE and have little or no prior knowledge about data protection. In table 1, the background of the test subjects is outlined. To maintain privacy, no personal data about the test subjects is displayed. The age span of the test subjects was between 23 and 62 years, with three females and seven males as part of the test group.

Table 1: Background of the test subjects.

Background	Data Protection Knowledge	GDPR Knowledge
ME (bakery)	Yes	No
SE (doctor)	Yes	No
SE (gardening)	Yes	No
ME (3D-printing)	Yes	No
ME (finance service)	Yes	No
ME (shoe store)	Yes	No
ME (restaurant)	Yes	No
SE (construction)	Yes	No
ME (hairdresser)	No	n.a.*
ME (clothing store)	Yes	No

ME = micro enterprise, SE = small enterprise
* Swiss organisation, exclusively operating in Switzerland

The feedback for the web application was predominantly positive. Most test subjects were impressed by the web application and enjoyed the user experience. The result page received a lot of attention, especially the visualisation of the need for action and the quick actions. Minor adjustments in font size and page margins. Nine out of ten test subjects would like to use the web application to assess the data protection maturity of their enterprise.

Some practical insights also pointed out weaknesses. Even though most test subjects have responded that they could answer the questions, they needed support to get started using the tool. The language choice contributed to a lack of clarity of the questions; the field tests revealed that English skills cannot be expected from every user in the German-speaking test region. An introduction for the topic of data protection and GDPR would be also helpful to prepare the users for the questions.

5 CONCLUSION AND OUTLOOK

This research resulted in a functional prototype for a self-assessment tool to check the data protection maturity of an MSE. In addition to the development of a prototypical web application, we could provide a concise presentation of the challenges of GDPR compliance for MSEs. The developed and evaluated artifact advances the state-of-the-art and is a value proposition for MSEs in Europe for the following reasons. The MSE GDPR Self-Assessment is a customizable platform that supports easy adaptation of contents and translation. It is flexible to be used in diverse contexts. The solution follows a privacy-by-design approach. Regarding the organization of content, it fosters both, an easy and actionable tool, building upon and putting forward the strengths of the existing GDPR assessment tools. In the final product, the questions are foreseen to be light and short, based on predefined standardized answers. Over-simplification is avoided by offering dedicated sections for information, examples, and links to selective information. Further, the assessment results are not limited to a number or percentage but visualized in form of a traffic light and actionable recommendations are provided.

A follow-up project could span the period from a prototype to publishing the final application. Two areas will be researched in future: First, the web application will be enhanced to further improve ease-of-use (work on partly achieved requirements and results from the evaluation phase). Although our study has helped to create an artifact that balances

simplicity and informative value, continued efforts are needed to improve the comprehensibility of the self-assessment questions. Second, we strive to conduct further research on the adaptability of the tool content; the unique potential of our prototype lies in the adaptability of the assessment questions. Since the target group of MSEs is broad, a self-assessment is relevant only if it can be tailored to the particular business situation. With our open-source solution and the possibility to modify the content with straightforward structured JSON files, we have laid a foundation. Further research is needed to extend and evaluate this adaptability. Once the web application will be publicly accessible, a quantitative evaluation could enhance the qualitative one conducted.

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