
EGOWEB QUALITY ASSURANCE SUMMARY

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This document summarizes EgoWeb's adherence to the quality model defined by ISO/IEC 9126 "Software Engineering – Product Quality." The findings come from a combination of interviews with the EgoWeb development team and a supplementary, independent expert review. It is intended for potential users of EgoWeb. By understanding EgoWeb's strengths, limitations, and risks, potential users of the software will be better positioned to evaluate how well EgoWeb is matched to their needs.

This document is organized as described in ISO/IEC 9126 where top level headings correspond to the sub-characteristics of Internal Quality, External Quality, and Quality in Use and second level headings correspond to the finer grain attributes of the sub-characteristic that can be measured. A brief definition is given for each sub-characteristic and attribute along. Finally, a qualitative description of EgoWeb's current standing in regards to each sub-characteristic or attribute is given.

1. **Functionality**

The capability of the software product to provide functions which meet stated and implied needs when the software is used under specified conditions.

- a. **Suitability** – *The capability of the software product to provide an appropriate set of functions for specified tasks and user objectives.*

The software meets the needs of a wide range of social network researchers for collecting and processing network data. It provides a variety of options for constructing social network data collection instruments with flexibility for presenting questions in a variety of ways. The data output is easily reformatted for processing in a variety of social network data analysis platforms.

- b. **Accuracy** – *The capability of the software product to provide the right or agreed results or effects with the needed degree of precision.*

The software accurately presents data collection screens for social network data collection projects. Data inputted into these screens is stored appropriately and can be viewed after the interview has been completed or exported for processing in another social network analysis (SNA) software. The software calculates basic network statistics and these statistics are accurate when compared to the same statistics calculated with other SNA software (R statnet, UCINET, etc.).

- c. **Interoperability** – *The capability of the software product to interact with one or more specified systems.*

EgoWeb can be installed onto Windows, Mac, Linux environments as well as deploy data collection instruments via iPad and Android apps. Server installations can be viewed over

the internet on Chrome, Safari, IE, Firefox, and other browsers on any type of machine with an internet connection.

Users who wish to run the Egoweb server (running on Apache, MySQL, and PHP) can do so with the LAMP (for linux), WAMP (for windows), or MAMP (for Mac) software packages.

Updates to browsers can sometimes cause problems with use of EgoWeb depending on changes made. These changes can usually be easily addressed once identified depending on programming availability. Chrome browsers are the primary browsers used for development and testing and are the most likely to have any browser based problems resolved.

- d. **Security** – *The capability of the software product to protect information and data so that unauthorized persons or systems cannot read or modify them and authorized persons or system are not denied access to them.*

EgoWeb has been tested for security vulnerabilities using OWASP standard web application security flaw checklist. Security vulnerabilities have been addressed including implementation of encryption and secure login procedures. All response data and personally identifying information (such as names of alters) are encrypted, as well as user names. Database and application can be set up on different servers to enhance security. Each egoweb server can be set up with a unique encryption key, making the database secure and difficult to decrypt without access to the application server. EgoWeb has been cleared by RAND's information security department to be installed on public facing RAND servers and should therefore meet most organizations' standards for software security.

- e. **Functionality Compliance** – *The capability of the software product to adhere to standards, conventions or regulations in laws and similar prescriptions relating to functionality.*

N/A

2. Reliability

The capability of the software product to maintain a specified level of performance when used under specified conditions.

- a. **Maturity** – *The capability of the software product to avoid failure as a result of faults in the software.*

The software has been used regularly at various stages of development without failure. New developments in the software require testing to determine avoidance of failure but versions of the software that are fully tested and made available via the "Master" branch in github are free of any known software faults causing failure. There are occasional problems with servers that run EgoWeb and these problems are at times difficult to diagnose but

EgoWeb is typically tested in a variety of environments prior to deployment as production/master versions.

- b. **Fault tolerance** – *The capability of the software product to maintain a specified level of performance in cases of software faults or of infringement of its specified interface.*

The main infringement that is possible that would interfere with software performance is loss of internet connectivity for server installations or loss of browser control/functionality for all types of installations. This is a potential problem for in-progress interviews that are cut off when some but not all data have been collected. In these cases, when the software is accessed again the interview can be easily retrieved as an incomplete interview and re-started.

- c. **Recoverability** – *The capability of the software product to re-establish a specified level of performance and recover the data directly affected in the case of a failure.*

All in-progress interview data are stored and available immediately as each question is answered. Once interviews are completed, a flag is set and they cannot be modified but until this flag is set interviews can be cut off and restarted exactly where they were abruptly ended easily.

Backend-wise, data can be recovered from the database if the encryption key (generally saved in the config file) is available. We have also had to recover data from failed iPad data uploads. In this instance data either remains on the server, or can be parsed from a raw JSON stored in the application error log.

- d. **Reliability compliance** – *The capability of the software product to adhere to standards, conventions or regulations relating to reliability.*

N/A

3. Usability

The capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions.

- a. **Understandability** – *The capability of the software product to enable the user to understand whether the software is suitable, and how it can be used for particular tasks and conditions of use.*

Documentation is provided at egoweb.info. Users who have not used EgoWeb before have been able to use this website to self-guide their use of EgoWeb. Some of this documentation is limited, some of it is outdated. Changes to EgoWeb are not often immediately described in egoweb.info.

Basic tasks in collection of social network data are easy to understand and novice users have been able to use them immediately. More complicated tasks such as set up of longitudinal networks are less transparent to the novice users but are easy to understand with some instruction.

Certain features that are used by social network researchers are not yet available in EgoWeb. For example, many data collection instruments use multiple “name generators” to identify network members. EgoWeb supports one name generator that can be customized for interviewers to give multiple name generator prompts, but there is no option to collect names based on presentation of different name generators.

b. Learnability – *The capability of the software product to enable the user to learn its application.*

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The software is easy to set up and run and experiment with surveys. This minimal effort required to get started enables users to learn more complicated features through a process of trial and error. Some of the more complicated features of programming a survey, such as creating “expressions” which are logical tests that allow for conditional presentation of questions based on previous responses, may not be as intuitive to learn without one-on-one instruction. However, many users do not require extensive logic in their instruments and simple expressions based on one previous question are easy to program and implement.

c. Operability – *The capability of the software product to enable the user to operate and control it.*

The software is easy to use for novice researchers. There are many examples of novice users being mostly self-taught and have been able to operate the software successfully. Most of the set-up required to program a survey is intuitive, such as filling in boxes with text, clicking check boxes, selecting options from drop-down menus, etc. There are no requirements for extensive script writing or learning a custom programming language.

d. Attractiveness – *The capability of the software product to be attractive to the user.*

The software produces attractive screens for all aspects, including programming and deployment of surveys. Survey screens were optimized for attractive presentation because of the occasional use for sending invitations to participants to complete their own surveys.

Users often comment on the attractiveness of the display of social network diagrams during interviews. These displays can be improved for layout and incorporation of more advanced social network data visualization techniques.

Compared to other comparable social network data collection software, EgoWeb is much more attractive and easy to learn and start using. Documentation can certainly be improved to make the process even more self-help. For example, help text can be embedded into the software so that users do not have to go to an external site to learn what the various options are for.

The attractiveness of the display can be modified in the settings. Standard EgoWeb display for data collection may not meet the attractiveness needs of a particular project. These standard display options (colors, spacing, button characteristics, etc.) can be modified in the administration settings for an instrument with cascading style sheets to provide flexibility of display. This is a new feature that has not been used extensively but is available.

- e. **Usability compliance** – *The capability of the software product to adhere to standards, conventions, style guides or regulations relating to usability.*

N/A

4. **Efficiency**

The capability of the software product to provide appropriate performance, relative to the amount of resources used, under stated conditions.

- a. **Time behavior** – *The capability of the software product to provide appropriate response and processing times and throughput rates when performing its function, under stated conditions.*

The software enables real time data collection with complicated survey designs. It runs smoothly with some slight delay between screens with very complicated surveys but usually is not too noticeable. If running over an internet connection, speed will vary based on upload and download speeds available.

There are known problems with laptops running the software that are maximized for portability and do not have as much computing power. The main problem appears to be encryption of data that is used during interviews, such as names of network contacts or skips of questions based on answers to previous questions. Data is being encrypted and unencrypted continually during the interview and this can cause some delays in screen loading for some more lightweight laptop machines. Tests of these delays by running the same survey on other laptops or server installations concluded that the machines were the primary source of the delay. The same surveys were not slow on these other machines.

There is some delay in data export when there is a lot of data being exported. It is more pronounced when network statistics are being calculated. This takes more time but raw data can be exported without requiring the stats to be completed. Also, smaller numbers of interviews can be exported to speed export and these can be combined on another

machine. Exported EgoWeb files can be combined on another machine running the latest version of EgoWeb and exported .csv data can be easily combined into one file for analysis in another system.

- b. **Resource utilization** – *The capability of the software product to use appropriate amounts and types of resources when the software performs its function under stated conditions.*

Resource utilization depends on the length of complexity of the studies being programmed in EgoWeb. Resources are determined by the server specifications, as well as the versions of PHP, Apache, and MySQL installed. A reference server implementation consisting of 4 cores @ 2Ghz each and 8GB of RAM has been sufficient for all scenarios encountered thus far.

- c. **Efficiency compliance** – *The capability of the software product to adhere to standards or conventions relating to efficiency.*

N/A

5. **Maintainability**

The capability of the software product to be modified. Modifications may include corrections, improvements or adaptation of the software to changes in environment, and in requirements and functional specifications.

- a. **Analyzability** – *The capability of the software product to be diagnosed for deficiencies or causes of failures in the software, or for the parts to be modified to be identified.*

The EgoWeb backend is based on the uncompiled/interpreted PHP language that can be easily inspected and debugged at a fine grain level using step-through and breakpoint debugging techniques. EgoWeb also has logging capabilities enabled to allow for more course-grain post hoc analysis and debugging. EgoWeb's front end is based on standard browser-interpreted JavaScript and can also be inspected and debugged using similar step-through and breakpoint debugging techniques..

- b. **Changeability** – *The capability of the software product to enable a specified modification to be implemented.*

EgoWeb is based on the standard web technologies of PHP, HTML, and Javascript. The majority of the code is in PHP where the Yii MVC framework is used to provide standard web application features and patterns. Best practices have been followed in terms of file organization, naming conventions, and module design. These combine to make EgoWeb easy to modify.

- c. **Stability** – *The capability of the software product to avoid unexpected effects from modifications of the software.*

Unfortunately, we can not guarantee stability if users make changes to the code. While it is easy to change EgoWeb once a sufficient understanding has been built up about the system, it can easily be made inoperable if naïve or short-sighted changes are made.

- d. **Testability** – *The capability of the software product to enable modified software to be validated.*

The application is organized into a standard MVC file structure. Functions are grouped into controllers which allows for unit testing of each controller and methods within them. Errors can be viewed from the application's log and apache's error log.

- e. **Maintainability compliance** – *capability of the software product to adhere to standards or conventions relating to maintainability.*

N/A

6. Portability

The capability of the software product to be transferred from one environment to another.

- a. **Adaptability** – *The capability of the software product to be adapted for different specified environments without applying actions or means other than those provided for this purpose for the software considered.*

The software can be installed and run on a variety of environments. Instructions are available for installation on these different environments. The software itself is capable of being run on Windows, Mac, Linux without any modification to the software itself. Each environment requires certain settings and supporting software (Apache, MySQL, PHP) but these are widely available and easily installed. EgoWeb uses standard UI libraries (Bootstrap, jQuery) which allows for compatibility between browsers and operating systems.

- b. **Installability** – *The capability of the software product to be installed in a specified environment.*

EgoWeb can be installed on Linux, Windows, Mac environments. It can be installed on servers, laptops, desktop computers. Server versions of EgoWeb can be synced with iPad and Android apps for data collection without live internet connections.

The main difficulty with EgoWeb is the number of steps required to install the software on machines running Windows and Mac OS. None of the steps are particularly challenging but novice users may make mistakes with the manual steps required. Older machines may require additional software and supporting files (e.g. .dll files) to be downloaded before the installation procedures can be completed.

Users who want to use server based features, such as deploying surveys through email invitations, collecting data with web browsers in the field over the internet, using the tablet

apps, may find setting up webserver versions of EgoWeb challenging if they do not have experience running Linux commands. However, users can establish inexpensive accounts with cloud server services and run Linux code to set up an EgoWeb server. The cloud service www.linode.com allows for running of a series of Linux commands in a “stack script” library that will allow setting up EgoWeb from scratch in less than 30 minutes without having to run any Linux commands manually.

- c. **Co-existence** – *The capability of the software product to co-exist with other independent software in a common environment sharing common resources.*

There are no known issues regarding problems with compatibility of the software with other software. EgoWeb requires Apache, MySQL, PHP, and web browser software to be installed. Linux servers require other settings but the latest standard software is compatible with EgoWeb.

- d. **Replaceability** – *The capability of the software product to be used in place of another specified software product for the same purpose in the same environment.*

EgoWeb can be used in place of the software EgoNet in Windows environments. Early versions of EgoNet provided code for early versions of EgoWeb but EgoWeb has been expanded for use in other environments. EgoWeb can be used for most of the features of EgoNet.

There are a few EgoNet features that are not in EgoWeb, such as collecting both first and last names of network contacts, but most of the functions required to collect social network data are available in EgoWeb.

- e. **Portability compliance** – *The capability of the software product to adhere to standards or conventions relating to portability.*

N/A

7. Quality In Use

The capability of the software product to enable specified users to achieve specified goals with effectiveness, productivity, safety and satisfaction in specified contexts of use.

- a. **Effectiveness** – *The capability of the software product to enable users to achieve specified goals with accuracy and completeness in a specified context of use.*

The software is fully capable of effectively collecting and processing social network data for the vast majority of SNA projects requiring data collection through interviews.

- b. **Productivity** – *The capability of the software product to enable users to expend appropriate amounts of resources in relation to the effectiveness achieved in a specified context of use.*

The software is easy to use to produce data collection instruments. Most time required to set up instruments is in the planning stage of thinking about what questions to ask, wording, response options, etc. EgoWeb allows for copy and pasting of text from other documents and allows for simultaneous testing and coding which speeds up instrument completion.

Developing and testing complicated surveys with a lot of skip logic options can be time consuming. The options for very complicated skips are challenging because they do not function intuitively. Most surveys do not require this level of complexity so this impacts only a small number of uses.

- c. **Safety** – *The capability of the software product to achieve acceptable levels of risk of harm to people, business, software, property or the environment in a specified context of use.*

EgoWeb involves no known risks for use in social network survey data collection. The biggest risk is in the data that are collected and the potential for exposure of data to third parties. However, this risk is minimized by password protections and encryption of data.

- d. **Satisfaction** – *The capability of the software product to satisfy users in a specified context of use.*

EgoWeb satisfies a growing number of social network researchers around the world. It is the go-to software for social network data collection at RAND, which is a leader in innovative approaches to applied Social Network Analysis. Outside of RAND, there are now users from a range of backgrounds employing it from other institutions around the world.

It does not do everything that can be done in a social network data collection interview. Also there are software options that have more user friendly graphically based interfaces. However, it is more functional than these other software options and is much more powerful for use with teams of interviewers collecting data with a large sample.