

Persuasibility and Its Assessment

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1. Introduction

Using computers in the affective domain has taken several forms. Particularly with the growth of the Internet and World Wide Web there are many applications developed to be distributed by computers that share commonality with other media such as print, video and advertising in terms of their intended affect on their audience. Just as these latter types of media have been used to influence the thinking of their subjects, i.e., to take a political stance, buy a product, or support a cause, computers now perform many of these same purposes. Computers have the potential to be significantly more effective simply because they have superior abilities to display material making it more enticing and interesting on an appearance level. Even more significantly, they are able to engage their users and can use this interactive environment as a context to persuade those users.

The use of computers to persuade can fall into one of two paths: programs that intentionally persuade and those that do so unintentionally. Here we are primarily concerned with explicit intentionality, that is, those systems designed with the intent to persuade their users to adapt or change their attitude or opinion, and how one can assess or evaluate their effectiveness in achieving persuasion.

Within the domain of intentionally persuasive computers are those designed to stimulate a positive change in attitude and those which seek to cause a negative change. While the strategies and approaches we propose could be used to evaluate either type of design intention, our focus is on the positive. We assume that a system designer wants to create a persuasive system with a positive outcome on its users, one that will improve their lives. Evaluating computer systems for persuasability is a heretofore uninvestigated area of research. This paper proposes the concept of persuasability and methodologies for assessing it.

2. Background

The study of computers as persuasive technologies was introduced at CHI 97 as a new area of inquiry [Dillard, J. & Pfau, M., 2002]. A Persuasive technology is any type of computing system, device, or application that is designed to change a person's attitudes or behavior in a predetermined way [Berdichevsky & Neunschwander, 1999]. There are at least two disciplines involved in persuasive technology: psychology and computing technology. Potentially, there could be other disciplines embedded in persuasive technology as well; it will depend on the project topic itself. Persuasive technology is a multi-discipline area.

There are some examples that implement persuasive technology, such as "Baby Think It Over" and "5 a Day Adventure" (www.dole5aday.com). Baby Think It Over infant simulator looks and acts like a real baby. The computer is embedded inside a baby simulator that can generate a crying sound at random intervals. A teenager has to stop the baby's crying by acting as a parent. The purpose of using this baby simulator is to persuade teenagers that they do not want to become a teen parent. Both computing technology and psychology are employed in this project. A similar application is the biology. 5 a Day Adventures, a CD-ROM that was created by Dole Foods, designed to persuade children to adopt positive attitude toward eating fruits and vegetables.

In today's broad range of computing technology applications, persuasive technology is just a small subset. Persuasive technology is usually realized only by designers who intend to use persuasion as a system requirement. There is also the possibility that a product will persuade user in unintended ways. For example, "Baby Think It Over" could actually encourage a teenager to become a teen parent. This is a potential unintended result of using this product.

There are two categories of persuasive technology carriers: traditional personal computer applications and electronic devices that use computing technology. The display form of persuasive design is different between these two categories. Therefore there is not a common set of criteria for evaluating both usability and persuasibility for both.

Computers act as media, they provide to users information and experiences using simulation technology. By providing simulated information, computers can persuade users to change their attitude or behavior. For example, the SkillTek¹ software simulates certain working environments and intends to persuade users to change the attitude about some professions such as healthcare and heavy equipment operators.

3. Description of evaluation persuasive technology

Persuasive technology has been the subject of research since 1997. The systemic evaluation of persuasive technology has not yet been a focus by designers or researchers of persuasive technology. Persuasive technology is interactive computing systems that are designed to change people's attitudes and behaviors. The issue is how a designer will know the final product has the desired persuasive ability. Is it possible to prescribe a standard methodology to assess the effectiveness of a persuasive technology design? The approach we propose focuses on identifying the relevant concepts and methods. They will provide persuasive technology researchers ideas to continue related research.

4. Persuasibility

Persuasibility is not a word found in a traditional dictionary, but one can find the definition in the online dictionary (<http://www.hyperdictionary.com/dictionary/persuasibility>). It means the *Capability of being persuaded*.

Here, *persuasibility* is a word in the class with many other words that end in “-ibility”. It is the inherent characteristic of persuasive technology design. Today, systemic evaluation of software usability is very well developed. However, as an element of software

¹ SkillTek is a program in the Department of Computer Science at Norfolk State University to investigate and deliver educational modules designed to help middle school and high school students understand certain professions.

usability, persuasibility testing or assessment is a nascent area of research. We are developing a systemic general theory and method for persuasibility assessment.

4.1 Design for persuasibility in persuasive product life-cycle

Persuasibility, as an inherent characteristic of persuasive product design, should be considered as part of the entire simulation software life-cycle. Basically, there are 4 phases in a simulation software product life-cycle, not dissimilar to many other systems and projects. These phases are shown graphically in Figure 1.

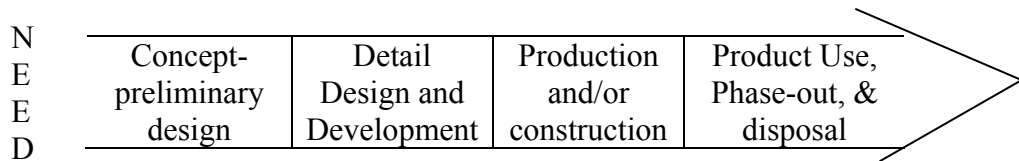


Figure 1. System life-cycle [Blanchard, B., & Fabrycky, W. ,1998]

Persuasibility design and assessment is embedded in system life-cycle which depends on the system performance requirement. These activities are discussed based on system development phases in the life-cycle.

4.1.1 Concept and preliminary design phase

During the concept and preliminary design phase, quantitative and qualitative persuasibility requirements for the application must be defined and analyzed. Planning and pre-assessment of persuasibility is done in this phase as well according to the persuasibility requirement. Both system designers and the potential users who participate in review of the software design should have a clear understating of the persuasibility requirements. Persuasibility requirements need to be allocated to the sub-system level in preliminary design stages. Formal persuasibility design review should cover the proposed design from the system view.

4.1.2 Detail Design and Development phase

In the detailed design and development phase, system designers specify the detailed design requirement; analyze persuasibility and support its design. Persuasibility predictions are done from time to time throughout the system life-cycle to support

persuasibility assessments. At the same time, self-assessments give designers feedback to correct persuasive design if it is needed. As in concept design phase, formal persuasive design review is necessary, but it focuses on system characteristics at the sub-system level. It is a process that needs to be repeatable and evolve throughout in the system life-cycle.

4.1.3 Production and/or construction phase

In this phase, persuasive technology is implemented in the product design phase. This is the time to do formal persuasibility testing and evaluation. Users must be involved in the system development phase testing. Persuasibility data is collected and analyzed.

Necessary corrective actions are taken by developers if assessment shows the product did not achieved the predicted and desired persuasibility requirement.

4.1.4 Product Use, Phase-out, & Disposal phase

In the product use and phase-out phase, persuasibility data collection, analysis, and assessment are necessary to support further product modification. Changes are documented for the system update and to support further research work.

4.2 Persuasibility Outcomes

There are many projects designed to persuade users. Basically, three behavioral outcomes are possible results of users being persuaded. Persuasibility assessments need different focus criteria depending on which of the behavioral outcome are desired.

4.2.1. Response-shaping Process

In this case, the user has limited knowledge of the software application prior to using the persuasive product. Persuasion is a type of learning process in this situation. For example, before using Baby Think It Over, users may have no idea about taking care of babies as teen parents. Part of the learning process is for them to think about what it takes to perform those tasks and accept the persuasion.

4.2.2. Response-reinforcing process

Persuasion-designed products not only persuade users to change their attitude, but also help user to maintain or reinforce an attitude and resist forces to change it. For example,

if users always know it is improper to be teen parents, by using Baby Think It Over, the desired result would be for its users to become more resistant to changing that attitude.

4.2.3. Response-changing process

Changing attitude or behavior is typically thought of when the term persuasion is used. In this case, users will change their attitude or behavior after using persuasion product. For example, before using Baby Think It Over, users would like to be teen parents. After using the product, they change their attitude and adopt the attitude that it is not wise to be teen parents.

By understanding these three behavioral outcomes, we can assess product persuasibility. We need to consider that the users of the product could experience different changes to their behavior because they will have different knowledge and backgrounds in the domain of the application prior to using the persuasive technology.

4.3 Persuasibility assessment

Now, we will focus on initial persuasibility assessment. When assessing persuasibility, the users of the technology are the primary focus. Users' attitude accessibility is an important concept. If an attitude can be retrieved from memory quickly, that means this attitude is highly accessible, and vice versa. During several experiments, Poskoc-Ewoldson and Fazio demonstrated that the people are more likely to keep their attention focused on an object if they have an accessible attitude toward that object [Dillard, J. & Pfau, M., 2002]. Consequently, it is easier to achieve the desired persuasion result. This provides persuasion researchers an approach to pursue higher persuasibility: the persuasive product should have a warm up section for some users followed by a response-shaping process. It is also possible to get feedback before and during the warm up section as input for the persuasibility assessment. Pre-assessment of users' attitudes could be performed in the warm-up section and used as the baseline assessment requirement. Direct experience makes it easier for users to access their memory [Dillard,

J. & Pfau, M., 2002]. In the other word, the simulation software could be a substitute for direct experience achieving a similar persuasive result. This is the motivation for our research.

To assess product persuasibility, quantitative as well as qualitative requirements are needed.

4.3.1 Quantitative assessment

A persuasibility assessment can be conducted using statistical methods based on data from questionnaires and surveys. Both of these can be used for usability evaluation. Questionnaires are lists of questions that users answer and return. Surveys are an interactive approach to obtaining feedback from a small group of users, instead of evaluation of large groups of users where a questionnaire is more appropriate.

Both of the methods can be implemented during any stage of a product life-cycle. For example, during pre-assessment in the concept design stage, questionnaires and surveys are designed by persuasive technology developers for use with users. After users answer the questionnaires and surveys, analysts collect feedback, and then analyze the data. The questions composing the survey and the questionnaires may be different based on the stages of the life-cycle. The results can be used to perform a qualitative assessment as we will discuss in the next section. Percentage of user satisfaction is an important measure for quantitative assessment. One example might be how many users change or retain their attitudes after using the software. Assessing the “strength” of an attitude is a significantly more challenging problem that requires additional more research effort.

4.3.2 Qualitative assessment

Qualitative assessment takes many forms that vary depending on the characteristic of software products. A persuasibility checklist can be used to perform a self-assessment. Persuasibility analysts can use it without the ultimate users’ participation. Some topics include:

- 1) Does the software contain enough necessary information to persuade users? The designers must consider whether users might have different persuasibility outcomes. If so, they may require different information.
- 2) Is the language and interface suitable for the target user group (age and background)? We need to insure there are no ambiguous features that unexpectedly influence user attitudes.
- 3) Is the information is credible to the users?
- 4) Is user accessibility to the software adequate?

Users' behavior and reactions in using the persuasive products is significant in performing persuasibility assessment. An evaluation can be performed by simply observing users interact with the software. Some observation foci are: Do the users show interest in the topic? Do they really focus on it? Do they get confused by any of the contents?

4.3.3 Persuasibility assessment procedure

Persuasibility design in system life-cycle was introduced in Section 4.1. Now, based on the persuasibility assessment methods we presented a persuasibility assessment procedure in that product life-cycle. It is shown graphically in Figure 2.

In Figure 2, developing a persuasibility assessment plan is the first task at the beginning of product development. All the other relative persuasibility assessment activities are scheduled in proper life-cycle stages according to this Persuasibility Assessment Plan. Questionnaires, surveys and checklists are designed in planning stage. Pre-assessment result can be used to better define the customers' requirement. Self-assessment is performed during the design and production phases to improve the product's persuasibility. After checklist analysis and synthesis, corrective actions are taken if necessary. These activities are implemented spirally during the three cycle phases. Final assessments can utilize questionnaires and surveys as tools. Questionnaires and surveys should be designed separately for different user groups according to the different persuasibility outcome. If a product needs to be updated or refined, this can be done in phase-out stage followed by post assessment.

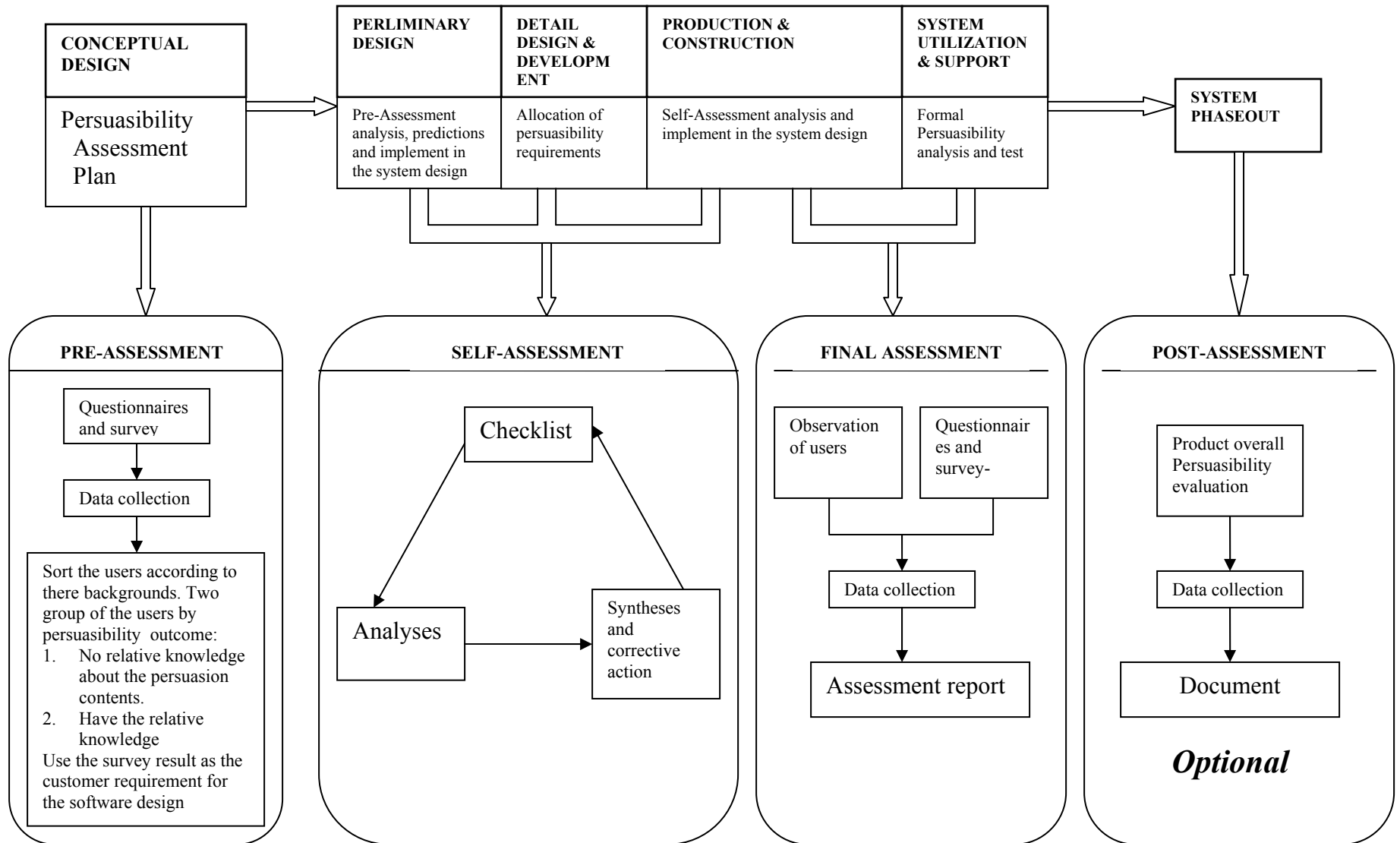


Figure 2. Persuasive assessment in life-cycle

5. Summary

This paper is the first attempt to combine the system engineering, usability evaluation and persuasive technology to define a structure for understanding persuasibility assessment. Based on persuasibility design analysis in the system life-cycle, the concept of persuasibility assessment and its methodology was presented. The system life-cycle was emphasized because it is the basis for managing system development. Our purpose is to provide the persuasive technology researchers the elements of a systematic theory and set of method for persuasibility assessment.

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