

Web-Based Information Systems: Developing a Design Theory

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Abstract. The purpose of this research is to determine a proposed taxonomy that classified information systems theory concerning how four main objectives are handled namely analysis, explanation, prediction, and prescription. This research used a descriptive qualitative and experimental research methods. This information technology system design stage is the stage after the analysis of the information technology system development cycle. The results show the definition of system requirements for information technology, preparation for design, or implementation describes how an information technology system can be formed. It can be seen in the form of planning, drawing, making a sketch, or arrangement of several separate elements into a unified whole and functioning. In conclusion, the most important thing in the development of information systems is the user and the system should be integrated.

1. Introduction

Information Systems has an impact toward information technology in organizations and communities [1]. It is because the web-based implementation of Education (WBE) requires proper support of information systems. The characteristics of the WBE make the design and implementation of IS befitting a difficult and time-consuming task that currently has a theoretical guidance. To overcome this problem, this research develops theory-based principles in the form of information systems Design Theory (ISDT). For the WBE, a lot of research has been done in the field of information systems starting from the design, delivery, use, and effective assessment of information technology in organizations and society [1]. Hereinafter, information systems development is carried out through several stages, where each step produces a more detailed than the previous stage. The initial stage of developing a system generally begins by describing user needs in terms of a strategic approach to the macro system, followed by a description of the strategic plan and the needs of the medium as well as long term organization. Information systems development includes the stages where system development always takes place incrementally. The development of a new system usually starts from a lack of clarity. From the various development models available, we have to use a development model that can help us to achieve a quality and integrated development process.

IS makes it easy for users to do all activities, one of which is in the dissemination of information [2]. The use of the website becomes tangible evidence of the development of information and communication technology as a means of disseminating information. The ease in the process of creating and using a website is a strength of the website [3]. The information system is an example of the websites use as a medium for the dissemination of information that is fast and accurate [4]. Information systems has functions in obtaining, managing, collecting, analyzing, and distributing information with specific objectives [5]. Information systems increase the amount of information dissemination and exchange in



various parts of the world. The use of information systems will increase the distribution of resources and the success of an organization [6].

The purpose of this research is to determine a proposed taxonomy that classified information systems theory concerning how four main objectives are handled namely analysis, explanation, prediction, and prescription. Five types of interrelated theories are distinguished: (1) to analyze, (2) to explain, (3) to predict, (4) to explain and predict, and (5) to design and action. The theory that is developed should depend on this problem and the questions that are addressed. The questions themselves should be considered against the state of knowledge in the area at the time. The primary goals of theory discerned are analysis and description. The theory describes the phenomena of interest, analysis of relationships among those constructs, the degree of generalizability in constructs and relationships, the boundaries within which relationships, and observations hold. The theory provides an explanation of how, why, and when things happened, relying on varying views of causality and methods for argumentation. This explanation will usually be intended to promote greater understanding or insights by others into the phenomena of interest. Besides, the prediction theory states what will happen in the future if certain preconditions hold. The degree of certainty in the prediction is expected to be only approximate or probabilistic in IS [7]. This research used a descriptive qualitative and experimental research methods.

2. Method

This research used a descriptive qualitative and experimental research methods. It shows that participatory action research is distinguished by the involvement of additional characteristics from practitioners both as subjects and another researchers [8]. An important change in participatory action research from traditional action research is the realignment of the roles of researchers and subjects in a more collaborative and synergistic form.

3. Results and Discussion

3.1. Theory for web-based systems

The Technology Acceptance Model was adopted from Theory of Reasoned Action (TRA), which is a theory of action based on the premise that one's reaction and perception of something, will determine one's attitude and behavior [9]. The Technology Acceptance Model developed from psychological theory, explains the behavior of computer users, which is based on trust, attitudes, intensity and the relationship of user behavior [10]. The purpose of this model is to explain the main factors of Information Technology (IT) user behavior towards IT user acceptance in more detail by describing IT acceptance with certain dimensions that the user can easily influence IT acceptance. The level of acceptance of information technology users is determined by six constructs, namely variables external variables, user perceptions about convenience, user perceptions about usability, user attitudes, behavioral tendencies, and actual use [11]. It is to test variables that can predict the level of user computer acceptance. Perceived usefulness and perceived ease of use are the basic determinants of computer use. The term information systems design theory has been used in a certain sense. This refers to a set of concepts, beliefs, conjectures, and general scientific laws, both natural and social, where designers map design problems effectively solutions for special classes of information systems problems [12].

The design theory is a theoretical belief, norm, and concept of the faculties on two distinctive characteristics of design [13]. First, each design refers to the theory-in-use and it can see the quality of the design produced. We can validate this theory when the application of design principles has been implemented with good results. Second, it is to provide effective normative ideas contained in guidelines for practicing by formulating general rules. This study used the first theory referred to as Kernel Theory. This is made as a collection of basic concepts, statements, or practitioners that are formulated scientifically. Theories used were made explicit through the codification hermeneutic process [11]. The Kernel Theory can make it possible to formulate predictions that can be tested from solutions and their behavior in the information system design process (see Table 1).

Tabel 1. Components of an IS design theory

Requirements / Goals	Describes the class of goals to which the theory applies
A set of system features	A set of IT artifacts hypothesized to meet the requirements
Kernel Theory	Theories from natural and soial sciences governing the design requirements or the process arriving at them
Design Priciples	A codification of procedures which when applied increase the likelihood of achieving a set of system features. There procedures are derived logically from kernel theories

A summary of the sub-theory of design theory covers every stage in designing all types of information systems such as the current theories in building information systems design theory that still general and accurate enough to help formulate in effective information systems design guidelines [13].

3.2. Definition of an Information Infrastructure

IT infrastructure is defined as a shared technology resource that provides a platform for detailed enterprise information system applications. IT infrastructure includes investments in hardware, software, and services such as consulting, education, and training, which are the largest in all companies or spread across all business units in a company. IT infrastructure consists of a set of software tools and applications that are needed to run large companies as a whole. However, IT infrastructure is also a set of firm-wide services that are budgeted by management and consist of human and technical capabilities. The service that companies can provide to customers, suppliers, and employees is the direct use of the company's IT infrastructure. Ideally, this infrastructure supports business strategies and company information systems. New information technology has a large impact on business and corporate information systems strategies. New information technology has a large impact on business and IT strategies, just as services can be provided to customers.

The ability to adapt to the changes that occur throughout the life of the system. The system is well-organized so that solutions can be made from within the system to adapt properly. Substantial characteristics of information systems whose features can adapt to the form of information system functions desired by users. Information systems that can adapt to the flow of reorganization and organizational transformation (service flow), can adapt to data construction (the core of the database) as a framework the basis of maintaining the information system operating structure and can adapt to management patterns including policy decisions, oversight of various types of authority (see Table 2).

Table 2. Components of a IS design theory for information infrastructures

Requirements / goals	Grow the installed base as to obtain momentum, manage flexibility, and offer openness for evolution
A set of system features	Evolving, shared, heterogeneous set of an installed base IT capability among a community of users
Kernel Theory	Complexity theory, evolutionary economics: <ul style="list-style-type: none"> • Enable organic growth and new combinations • Gain momentum • Recognize path dependency • Create lock-in through positive network externalities • Use modularity to offer organic growth and evolution
Design Principles	A codification of five design principles which when applied will increase the likelihood of achieving a desired set of system features i.e. managed complexity, openness, and growth in the installed base: <ul style="list-style-type: none"> • Design initially for usefulness • Draw upon existing installed bases • Expand installed base by persuasive tactics • Make it simple • Modularize by building separately key functions of each infrastructure, use layering, and gateways

In addition, to the components of development, some factors can increase the success of information systems development involving users. Users here are all people involved in the development, whether it is external parties (developers) or internal (companies) such as users, analysts, designers, programmers, builders, managers, owners, etc. There is a method of approach to problem-solving, namely Structured Problem Solving. Documenting the development process is done to determine the strengths and weaknesses of a system that is being developed. A good system is an integrated system with IT, some standards serve as benchmarks for an ideal and competitive system. Usually, analysts make common standards that characterize dynamic and advanced systems such as the use of database technology, software, and so on. A good system in the present and future must be flexible. Therefore, if you want to make improvements, the development is only done in several aspects.

4. Conclusion

From the results obtained, we can conclude that some factors can make the information systems development increase the success by involving users. The development process should be documented for determining the strengths and weakness of a system. The most important thing in the development of information systems is the user and the system should be integrated. Some standards serve as benchmarks for an ideal and competitive system.

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