Research on the Construction of Green Management Information System for Sustainable Development

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Abstract. Faced with the fact that sustainable development has gradually become the common goal of all mankind, the traditional management information system has been difficult to adapt to this historical trend, so it is of great significance to study green management information system in the context of the new era. Starting from the concept of green, this paper combines the theory and method of life cycle and management information system development to theoretically discuss the greening of management information system planning and development. Based on the full consideration of economic and environmental benefits, this paper proposes the relevant methods to realize the greening of management system planning and development. And the related methods of green development have certain reference significance for the implementation process of green concept and management information system integration.

1. Introduction

In recent years, a series of problems such as global warming and frequent natural disasters have become the focus of increasing attention of countries around the world. In 2009, the United States formulated the Draft Energy Efficiency Standard for Household Appliances. In 2012, the European Union promulgated the Seventh Environmental Action Plan Draft. In 2017, the Ministry of Environmental Protection of China issued the Development Plan for the National Environmental Protection Standards. Therefore, the academic community has also launched a research boom on sustainable development, green and environmental protection. In 1994, Mccloske and Maddock proposed the concept of “environmental management” for the first time and gradually formed the concept of green human resource management. In 1996, Michigan State University Manufacturing Research Association first proposed the concept of green supply chain, 2003 British Energy White Paper the Future of Our Energy: Creating a Low-Carbon Economy presents the concept of a low-carbon economy for the first time. It is based on the real environmental problems and the research on green theory in various fields. Integrating the green concept into the planning and design of the management information system is of great significance for realizing the greening of the management information system.

How to achieve green and environmental protection for management information systems can be traced back to research on green IT. With the development of information technology, the consumption of energy such as electronic devices has gradually attracted attention. Therefore, green
IT aimed at reducing energy consumption and resource conservation came into being. Murugesan studies the connotation of green IT and proposes that green IT refers to a kind of environmentally friendly IT technology, which is reflected in the aspects of environmental sustainability, energy efficiency and economics of processing and recycling costs [1]. Erek et al. studies green IT from the strategic perspective. They review the basic methods of strategic management and information system research and conceptualize the strategic green IT coordination framework to identify four distinct green IT strategies [2]. Hameed et al. develops a conceptual model for IT innovation in the organization using a process model and proposes a model with an interactive process perspective that takes into account organizational level analysis until technical and personal level analysis is obtained for users to accept IT [3]. Gu et al. proposes a green strategy model that provides decision makers with a decision on whether to adopt a green strategy and ultimately how to maintain the consistency of information with the business strategy [4]. Molla explores the extent to which green IT can penetrate corporate awareness. Molla tested some theories about the influence of institutional power and organizational motivation on the adoption of green IT [5]. Boudreau et al. conducts a comprehensive review of the practical and academic literature surrounding green IS by identifying the significant overlaps and differences in the current literature [6-7]. In addition, scholars have studied from the perspective of the characteristics of green IS and the evaluation of green IS.

Based on the above researches, starting from the significance of integration of green concept and management information system, this paper proposes that green concept is the driving force for the development of management information system and the green concept is the goal of optimization of management information system. On the basis of exploring the characteristics of green management information system, the green management information system is built around the planning, analysis, design and implementation of the management information system.

2. Overview of Green Management Information System

The green construction of management information system is an important guarantee to improve the level of production and operation management and build core competitiveness. Taking green concept as the guide and realizing green quality management is the way to build a new type of enterprise development momentum in the new era.

2.1. The Significance of Integration of Green Concept and Management Information System

The concept of green and sustainable development has penetrated into all walks of life in society. It is equally important for management information systems. The green concept provides a new way of thinking and the direction of science for the development of management information systems. Green Management Information System (GMIS) is a management information system that integrates the laws of ecological development, which indicates the transformation of enterprise management from the traditional enterprise economic development model to the modern enterprise's ecological economic development model. In the pursuit of economic interests, modern enterprises must shoulder the heavy responsibility for promoting the sustainable development of the social economy and maintaining the ecological balance and pursue the unification of economic and environmental benefits. The implementation of the green management information system, which aligns the economic benefits of enterprises with the sustainable development of the ecological environment and society, has far-reaching significance for implementing the sustainable development strategy and is conducive to achieving greater development and breakthroughs in the national economy.

Firstly, the green concept is the driving force for the development of Management Information System (MIS). Under the traditional extensive management model, he management information system is guided by economic benefits and lacks the guidance of green ideas. However, under the background of advocating green environmental protection and ecological civilization construction, the development of management information system should be guided by green concept, transform the development model, optimize the development process, fully penetrate the "green" concept into all the core links of management information system and improve the dynamic role of green concept in
management information. In addition, the green management information system is based on the integration of a comprehensive corporate development strategy and green concepts, clarifying the objectives of the green management information system and further deepening the effectiveness of the management information system.

Secondly, the green concept is the goal of the optimization of management information system. The construction of traditional management information system highlights the efficiency and economic benefits of management to promote the construction of long-term development strategy of enterprises. The management information system under the green concept takes the sustainable development of enterprises as the starting point, optimizes the internal and external environment of the management information system through green, efficient and low consumption and supports the sustainable development of enterprises. To achieve the greatest green benefits at the lowest cost, the concept of green runs through the whole management information system. Therefore, the management information system is the practice of green concept, based on the strategic considerations of sustainable development and it is a strong support for maximizing the benefits of green economy.

2.2. The Characteristics of Green Management Information System

The green management information system not only has the functions of the traditional management information system, but also has the role of promoting the green management and sustainable development of the enterprise management process. Compared with the traditional management information system, the green management information system has the following characteristics.

2.2.1. Reduce the Consumption of Resources. Management information system plays an important role in the production activities of enterprises. Through the green transformation of management information system, it can improve the utilization rate of enterprise resources, reduce energy consumption and achieve sustainable economic development. Reducing energy consumption has double meanings. It not only refers to reducing the consumption of resources in the process of operation and maintenance through the implementation of management information system, but also requiring the internal construction and development process of management information system to reduce the consumption of resources.

2.2.2. Reduce Environmental Pollution. The development of green management information system is a systematic project. Every stage from system planning to system operation and maintenance should control the pollution of the environment and achieve the best overall benefit. In the system implementation stage, not only the equipment with low pollution and low radiation should be selected when purchasing computer and other auxiliary equipment, but also the proper cleaning treatment should be carried out when the equipment is discarded and recycled.

2.2.3. Guidance. The green management information system (GMIS) is to find out the material support to provide decision-making basis for the green development of enterprises by analyzing the production and operation activities of enterprises. For example, the green management information system can analyze and forecast the carbon dioxide emissions of enterprises through large data analysis; it can also analyze the energy consumption of products produced by enterprises; through the guidance of the green management information system, it can make scientific decisions on the environmental protection strategy of enterprises and constantly improve the green progress of enterprise management.

2.2.4. Dynamics and Openness. The dynamics and openness of the green management information system is reflected in the following two aspects. Firstly, it can quickly adapt to the changes of enterprise green development strategy. The green management information system and the green development strategy of enterprises support and influence each other. The green development strategy covers the green management information system, which provides a supporting platform for the
development of the green management information system, while the green management information system serves the green development strategy of enterprises. Secondly, the guidance requires enterprises to make corresponding adjustments according to the feedback results of the green management information system and constantly improve the green management information system to meet the development requirements of the organization.

3. The way to build green management information system
The green management information system is constructed by running the “green concept” throughout the life cycle of the management information system. The construction process of the green management information system is shown in Figure 1. From the four aspects of green system planning, green system analysis, green system design and green system implementation, we will build a green management information system for the whole process and all employees.

Figure 1. Green management information construction process.

3.1. Green system planning
The green system planning is based on the economic benefits, environmental benefits and social responsibilities of the enterprise. After preliminary investigation by the system developers, the overall objectives and structure of the system are determined and then implemented in several stages. This paper describes the process of green system planning from the knowledge required for green system planning, the stage of green system planning and the steps of each stage.

3.1.1. The knowledge and literacy required for green system planning. To achieve green planning of the system, first of all, from the personnel of the system planning, the personnel engaged in green system planning should have environmental awareness, green concepts, professional knowledge and skills and strategic vision.

3.1.2. The stage of green system planning. It is the representation of the work process or stage of greening the system planning. The green system planning work phase is shown in Figure 2.
Environmental analysis includes internal environmental analysis and external environmental analysis. The internal environment analysis involves the hardware requirements, development capabilities and business environment of the management information system; the external environment analysis contains the political environment, the social environment, the technical environment and the economic environment. In the analysis of the political environment for the green planning of the system, we must not only pay attention to the policies related to the company's own interests, but also timely and accurately grasp the relevant environmental protection policies; in the economic environment analysis. We must not only pay attention to the economic benefits of the enterprises themselves but also to environmental benefits.

The demand analysis is to clarify the economic and green needs of the company's development MIS and to combine the current technical level, management level and hardware conditions to determine the target to be achieved by MIS.

After determining the target of MIS, a development plan is initially formed. The development plan mainly includes a green person plan, a green hardware plan, a green financial plan, and a green implementation plan. The green development plan refers to a series of environmental protection measures to reduce environmental pollution throughout the development process. The green personnel plan refers to the selection of employees with environmental awareness and professional knowledge to participate in the entire management information system development process; the green hardware plan refers to prioritizing new environmentally friendly equipment when purchasing the hardware equipment required by the management information system; the green financial plan refers to the full consideration of environmental factors in the management of funds throughout the life cycle of management information system development; the green implementation plan is a series of implementation measures based on the green personnel plan, green hardware plan and green financial plan.

After the initial development of the green development plan, the plan will be run for a period of time and evaluation. In addition, analysis and feedback will be carried out during the operation process to continuously improve the green development plan. After the final evaluation and feedback, a relatively complete green development plan is obtained.

3.1.3. The steps of the green system plans’ each phase. Including the initial steps and the following steps in the comprehensive phase, the steps of each phase of the green system planning are shown in Figure 3.

First of all, we must clarify the problem to be solved as well as collect and understand the relevant issues. For example, in the environmental analysis of time dimension, the content of environmental analysis and the effect of environmental analysis first of all should be clarified. It needs to combine the content of the study and summarize the problem and describe them in a concise and effective way. After summarizing and summarizing, we get the concise expression of the problem analyze that in detail and propose a solution. Then, by using the analytical comparison method which includes comprehensive consideration of the internal and external environment of the enterprise and the selection of realistic and feasible methods, it gets a new understanding in the practice of the method and then modify and improve the original method.
3.2. Green system analysis
The green system analysis is a detailed investigation of the current system, which focuses on the analysis of factors such as uneconomical and non-environmental protection in the current system, analyzes the causes and proposes corresponding solutions. After the continuous improvement, the basic objectives and logical functions of the new system are finally determined. Form a logical model. The green system analysis process is shown in Figure 4.

3.3. Green system design
The green system design is a technical solution for implementing the logic model based on the functional requirements of the green system analysis combined with the actual problems feedback during the implementation process. The ECRS principle is a powerful method for optimization analysis. Based on the overall structural design, input design, output design, etc., the ECRS principle is used to optimize the design.

The ECRS principle is elimination, combination, rearrangement and Simplification. First of all, it is necessary to consider the elimination. Elimination refers to eliminating unnecessary programs in the
system design process, unnecessary structures and functions and eliminating the phenomenon of non-energy saving and environmental protection in the design process; and combination refers to the process of system design in which two or more parts with similar structure and function are analyzed while one structure and function can be combined; rearrangement refers to whether menus and buttons can be rearranged during user interface design in the overall structure design of the software and whether the relationship between one module and the other can be rearranged when the process design is performed as well as whether the process can be rearranged, etc., to achieve the purpose of improving the user experience; the simplification means that the user interface can be designed and the menu is considered whether the button and the like can be simplified and whether the processing flow can be simplified, etc. which can simplify the operation efficiency of the management information system. The ECRS optimization design process is shown in Figure 5.

![Figure 5. ECRS optimization design process.](image)

**3.4. Green system implementation**

Green system implementation is the last link in the construction of green management information systems and is a key stage in transforming green design solutions into practically available systems. Green system implementation requires that the system implementation process be carried out effectively and economically. Based on the concept of 5S management, this paper proposes a green system implementation plan for 5S management.

**3.4.1. Seiri.** The work procedures required for the implementation of the green system are collated to distinguish which jobs are green and which work has green space.

**3.4.2. Seiton.** Work on the implementation of the system, such as computer network, database system, system debugging, etc. to establish a standardized work flow, in order to reduce training and other related costs, to renovate the green space of the work procedures to achieve environmental protection and economic development.
3.4.3. **Seiso.** Clean up the site where the green system is implemented, do the work on the site of the system implementation and treat the things that hinder or affect the implementation of the green system as the object of cleaning and ensure that the green system is implemented efficiently.

3.4.4. **Seiketsu.** The purpose of the above sorting, rectification and sweeping is to Seiketsu and to enable green system implementation to be efficient and green. In the process of implementing the green system, it is necessary to correct the deficiencies and deeply understand the significance of sorting, Seitoning and cleaning, so that the implementation of the green system will spiral upward.

3.4.5. **Shitsuke.** Shitsuke is the core of 5S. Through the above sorting, rectification, sweeping and cleaning, it is a good habit for individuals. For the enterprise, it forms a green corporate culture and counteracts the first fours.

4. **Conclusion**

The advanced concept of green development which runs through the life cycle of management information system and the realization of green management information system is an important goal of building green development of enterprises. This paper theoretically not only studies the integration of green concept and management information system, but also puts forward the basic characteristics of green management information system and uses systematic engineering ideas and a series of optimization methods to analyze the way to build green management information system and enterprise green management information system. The construction can not only achieve effective information sharing, but also improve the efficiency of all aspects of the enterprise’s work, reduce unnecessary waste for the enterprise, further reduce the operation and maintenance costs and product costs and truly consider the environmental and economic benefits. The balance of the company bringing profits to the enterprise also pays attention to protecting the environment on which human beings depend, so as to be of great significance for realizing the green and sustainable development of enterprises.

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