

## The Mediating Role of the Green Information Technology (GIT) Acceptance in the Relationship between Green University and Sustainable Development of the Environment

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### نقش میانجی پذیرش فناوری اطلاعات سبز در رابطه بین دانشگاه سبز و توسعه پایدار محیط‌زیست

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#### Abstract:

Because of the rising energy prices and the spread of environmental crises; today, societies need to purposive education for Sustainable Development of the Environment (SDE). Therefore, it seems that universities, as the organizations for teaching, are suitable to be chosen as the starting point for environmental protection. Hence Green Universities (GU) can play an important role in the SDE through education for environmental awareness and the use of Green Information Technology (GIT). The aim of the present study was to investigate the mediating role of GIT Acceptance in the relationship between GU and SDE. The study is categorized as applied research in terms of purpose and designed as a descriptive correlational study in terms of the data collection method. The statistical population of the research included the staff of the science and research branch of Azad University in the year 2018, from which 168 people were selected according to Cochran's formula by stratified random sampling. The data collection tool was a questionnaire. The validity of the questionnaire was confirmed to be convergent and consistent, and the reliability was confirmed using Cronbach's alpha coefficient. In order to analyze the data, the SPSS 25 software was used for the inferential statistics, and the LISREL8.8 software was used to fit the path. The results showed that the dimensions of GU had a positive and significant relationship with acceptance of GIT and SDE. Also, GIT, as a mediator variable, generated a positive relationship between the dimensions of GU and SDE.

**Keywords:** Green University, Green Information Technology, Sustainable Development of the Environment.

#### چکیده:

جوامع امروزی به دلیل افزایش قیمت انرژی و گسترش بحران‌های محیط‌زیستی، نیازمند آموزش‌های هدفمند در جهت توسعه پایدار محیط‌زیست می‌باشند. لذا به نظر می‌رسد انتخاب دانشگاه‌ها به عنوان کانون آموزش برای نقطه آغازین حفاظت از محیط‌زیست، مناسب باشد. از این رو دانشگاه سبز می‌تواند از طریق آموزش در جهت آگاهی‌های محیط‌زیستی و استفاده از فناوری اطلاعات سبز، نقش مهمی در توسعه پایدار محیط‌زیست ایفا کند. هدف پژوهش حاضر بررسی نقش میانجی پذیرش فناوری اطلاعات سبز در رابطه بین دانشگاه سبز و توسعه پایدار محیط‌زیست می‌باشد. پژوهش حاضر از لحاظ هدف، کاربردی و از لحاظ نحوه گردآوری داده‌ها، جزء تحقیقات توصیفی از نوع همبستگی است. جامعه آماری تحقیق، کارکنان واحد علوم و تحقیقات دانشگاه آزاد در سال ۹۷ است که از این میان ۱۶۸ نفر بر اساس فرمول کوکران به روش تصادفی طبقه‌ای انتخاب شدند. ابزار گردآوری داده‌ها، پرسشنامه است. روایی پرسشنامه به صورت همگرایی و محتوایی و پایایی پرسشنامه با استفاده از ضریب آلفای کرونباخ تأیید شد. جهت تجزیه و تحلیل داده‌ها از نرم‌افزار SPSS 25 در بخش استنباطی و از نرم‌افزار LISREL8.8 برای برازش مسیر استفاده شد. نتایج نشان داد، ابعاد دانشگاه سبز رابطه مثبت و معناداری با پذیرش فناوری اطلاعات سبز و توسعه پایدار محیط‌زیست دارد، همچنین فناوری اطلاعات سبز به عنوان متغیر میانجی، بین ابعاد دانشگاه سبز و توسعه پایدار محیط‌زیست رابطه مثبتی ایجاد کرده است.

**واژه‌های کلیدی:** دانشگاه سبز، فناوری اطلاعات سبز، توسعه پایدار محیط‌زیست.

## Introduction

The increasing competition in global markets and technology growth have caused an increase in the number of the individuals who are attempting to gain a higher share of the world's resources and do not pay attention to its harmful consequences, such as environmental pollution (Araste & Amiry, 2012). Since environmental destruction has become a global crisis, and its scope is increasing, achieving sustainable development faces a serious problem (Falahy, 2016). Sustainable development is a concept that seeks to maintain long-term welfare for humans (Mehrabiyani & Zohraby, 2014). Basically, sustainability is a model for future discussion, in which environmental, social and economic considerations for promoting quality of life are in a balanced position (The World Commission on Environment and Development, 1987). Therefore, in 1992, the first heads of states and governments conference entitled "The United Nations Conference on Environment and Development" was held in Rio de Janeiro, which put development and environment together and resulted in the creation of a development program for the 21st Century, in which all dimensions of development were considered. In 2002, the heads of states and governments conference entitled "The World Summit on Sustainable Development" was held in Johannesburg, which propounded the integration of development and environment under the title of "Sustainable Development" (Cunningham et al., 2003). According to *Brandt Land* Commission in 1987, sustainable development is a development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (Taghva et al., 2017). Also, according to the definition of the World Commission on Environment and Development, sustainable development is the flow of change in resource use, investment,

leadership, the direction of technological development, and finally institutional change that is balanced and adapted to the present and future needs (Nasiry, 2000). Therefore, sustainable development of the environment is of particular importance. Protecting and preserving the environment will never be an obstacle to development, but the environment is the necessary field for development. The ultimate goal of development is to improve the living standards of the community. Therefore, one who wants to support and protect the environment should never forget about the organic integrity and relationship between the environment and development (Lavasany, 1993; Seers, 1969). Accordingly, the need to train individuals to achieve a sustainable environment is felt.

Because education is one of the most effective influencing factors on the development of each country, measures are needed to be taken in order to increase environmental awareness (Zoroofchy et al., 2014). Higher education has the ability to move towards sustainable development due to its very high impact coefficient (Barlett & Chase, 2004). Moreover, higher education, in addition to fostering reasoning and wisdom, also emphasizes self-esteem in order to educate aware citizens for all conditions (Araste & Amiry, 2012). In 2002, the United Nations named the period between 2005 and 2014 the "Decade of Education for Sustainable Development" (DESD)<sup>1</sup> (Kawabe et al., 2009).

The use of the term green, after the mid-1980s, has become increasingly widespread in the virtual sense of compatibility with the environment and has become commonplace in discussions (Hajizadeh & Ghasemy, 2012). In fact, for a science, product, or service to be green means to reduce energy consumption, raw materials, and water use, as well as

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1. A decade of Education for Sustainable Development

minimizing pollution and waste for maintaining and refining the quality of the environment, which consequently corrects the pattern of use and reforms environmental behavior of the community (Hadady, 2016). Green University does not mean green vegetation; to plan a Green University is to manage all activities and human environments with the least harm to the environment. Green University also means to use the minimum energy required for university systems, furthermore, saving resources, and separating waste is among the criteria of a Green University. In fact, Green University is a benchmark based on the Green Metric system. It uses six key indices, environment, infrastructure, energy, climate change, waste management, water, transport and education for university rankings, and has been launched with the aim of providing a comprehensive outlook for environment conditions and policies and sustainable development at various universities (UI GreenMetric; Zoroofchy et al., 2014). Green University is a university in which all its activities, including education, research and all existing services (health, finances, laboratories, workshops, etc.), health, safety, environmental protection and efficient use of resources and materials can be emphasized and pursued in realizing the goals of sustainable development of the community (Zoroofchy et al., 2014). For this purpose, all academics, such as professors, staff, and students, should participate in the protection of the environment and its sustainable development, and be educated in this area. Therefore, with the joint effort of academics, the green rise is taking place in different countries, for example, among the developed countries, the American Atlantic College is at the top of the list of the greenest universities with zero carbon emissions. Among the developing countries, Green University of Bangladesh and Green University of Sri Lanka in Columbia (UI GreenMetric), and in Iran, during the celebration of the Environmental Research

Week in 2016, University of Zanjan, had the first rank, Isfahan University of Technology and Islamic Azad University of Science and Research jointly ranked second and Qazvin University of Medical Sciences and Abu Ali Sina University of Hamedan had the third rank as the green universities of the country (Iran Environment Protection Organization). As an important training complex, the university can carry an important part of the burden of responsibility and planning to adopt the most appropriate strategy for implementing environmentally friendly programs and using renewable and sustainable resources. In Iran, universities should also take steps in this field because, given the climatic conditions of Iran, preservation of the environment and its sustainable development is one of the most important concerns of the country. In this way, universities, in addition to the main functions of education, research, and services, by implementing the principles of sustainability within their framework and managing their hardware and software, can be good models for organizations and institutions of the society. So that other institutions will find out about the activities and functions of green universities, and will firstly understand that the principles of sustainability are practical, and, secondly, will learn how to implement sustainability principles (Araste & Amiry, 2012). But because universities are among the centers that make extensive use of computers and communication tools, they have a large share of the resources and energy of the communities that, in this regard, are considered as a major problem faced in the eco-friendly progress of the communities and organizations. Therefore, Green University needs to take steps to reduce the destructive effects of today's world technologies, one of the most important and most comprehensive of which is information technology (Taghva et al., 2017). Increased energy consumption due to the use of ICT equipment, massive volumes of irreversible electronic waste, uncontrolled use of fossil fuels, etc., all has led to serious

damage to the environment (Mohamady, 2017). Information technology products have significant effects on the environment (Alavypoor et al., 2013). They include known chemicals that are considered as a threat to the human and environment health, such as mercury, cadmium and radiation intruders that produce electronic waste at the end of their lifecycle (Bose & Luo, 2011). Energy Growth used by information and communication technology is a disturbing event, and in a situation where energy resources are limited, it creates an obstacle to the development of ICT services (Maccani, 2011). With increasing energy consumption and the loss of non-renewable resources, increasing environmental pollution, the effects of greenhouse gases from e-waste and toxic products in the world, industry activists sought to implement a framework called "Green Information Technology Plan" in order to comply with social obligations, optimum use of natural resources and reduce pollution (Ahmady, 2012). Accordingly, on July 12, 2009, the official journal of the French Republic stated: Green information technology is information and communication technology that is designed and used to reduce the negative and destructive impacts of human activities on the environment (Taghavyfard & Samady, 2014). The goal of green information technology is to reduce the use of resources, energy, and electric waste generated by IT equipment, but these goals alone will not be sustainable and green, but also require support and attention of the managers of the organizations and especially the education sector of the country. Because of the fact that universities can use and develop green thinking in the field of green information technology with appropriate education (Khaliliyan, 2017), with a significant effect on the community, they can play a key role in sustainability (Dagiliūtė et al., 2018). Therefore, given the importance of sustainable

development and the preservation of resources for future generations, as well as the highlighted role of information technology due to the expansion of virtual networks and the increasing users of social networks and the Internet, the need for a green university is felt. On the one hand, universities use a wide range of IT technology, and on the other hand, the university graduates as the future managers and officials can play an important role in sustainable environmental development. Therefore, considering the fact that with the emergence of green universities and the adoption of green information technology we can take a major step towards sustainable development of the environment, the purpose of the present study was to investigate the mediating role of the acceptance of green information technology in the relationship between green university and sustainable development of environment at Islamic Azad University, Science and Research Branch.

### **Green University**

All individuals in the community should contribute to the transition to a sustainable world. Meanwhile, universities, as the catalyst for this move play an important role. In the past, universities have played a positive role in transforming society and creating supranational societies. The urgent need of the community and the appeal of everyone for sustainable development allow universities to be regarded as the main factor with the moral responsibility of guiding the community in the path to sustainable development and attaining a sustainable future (Waas et al. 2010). Since 1970, when the universities attempted to save resources and conserve energy, the term Green University became widespread (Araste & Amiry, 2012). Green University represents a major responsibility for higher education for community development (Hadady, 2016). Worldwide today, there are many indices for evaluating the quality of universities in terms

of education, research, service, social communication and, more recently, the environment, which led to specialist evaluations based on these indices, including environmental indices (Tabatabaie, 2016). Universities all over the world rank each year according to different criteria. In 2010, the University of Indonesia, for the first time presented UI Green Metric based on three basic concepts of the environment, economy, and community (Mohamady, 2017). In 2016, University of Davis, California, with the highest score among 516 universities and colleges evaluated in 74 countries was the greenest institution in the world. Among the universities in Iran, Zanjan University ranked 75th, Ferdowsi University of Mashhad ranked 238th and Tehran University ranked 431st among the top 500 first universities in the field; ranked first to third in Iran (Tabatabaie, 2016).

### **Green Information Technology**

Due to the increasing development of ICTs in all aspects of human life, the topic of Green Information Technology is one of the most important topics in the world. IT industry is one of the largest energy consumers in the world. Energy cost and social responsibility have led organizations to move towards the development of green technologies. Hence, the creation of green information technology plans is essential in order to find practical solutions to improve business survival and cost savings superior to the existing methods (Bose & Luo, 2011). Green information technology is trying to find a solution and help organizations to maintain the environmental sustainability. The experts have introduced green information technology as a technical solution to support eco-friendly business objectives (Murugesan, 2008).

According to US Environmental Protection Agency, greenhouse gas emission from electric power generation (including energy consumption in ICT industry) with about 32% is ranked the 1<sup>st</sup> and emissions from transport

activities are roughly 28% and ranked the 2<sup>nd</sup>, while the third rank is for greenhouse gas emissions from the industry (EPA, 2014). It is also estimated that every computer in operation produces one ton of carbon dioxide over a year (Kirwin, 2006). Green information technology, with the potential to reduce greenhouse gas emissions by up to 15 percent, can be very effective in sustainable environmental development (The Climate Group, 2008). It also recognizes environmental compatibility. This topic, which was once just a bit more than a moral motive for companies, is now a necessity for doing business and consequently a necessity for information technology (Murugesan, 2008; Velte et al., 2008; Watson et al., 2010). In recent years, due to the prominence of the topic of environmental sustainability, the use of green information systems as well as green information technology has received increasing attention (Watson et al., 2010). Green technology follows the following four objectives using eco-friendly standards:

1. Environmental protection using natural and renewable resources
2. Recycling and reuse of IT-centric products
3. Reducing waste and pollution by changing models of production and consumption
4. Continuous presentation and innovation of resource use standards in such a way as not to endanger the health of the human force and the environment (Apak & Atay, 2015).

### **Sustainable Development of the Environment**

Nowadays, some of the technologies that provide comfort and well-being for humans do not have the needed foresight and thus have created many problems for the environment. This process has led international institutions to give attention to the concept of sustainable development. Sustainable development shows that in the third millennium, the main issue of the international organizations, scholars and scientific and research centers is the existence

of environmental problems that are growing and the human being is considered as an effective factor and at the same time, the victim of this crisis (Lockwood, 1999). Hence, environmental protection division follows the sustainability of a healthy ecosystem that continually provides important products and services to humans and other organisms (Blewitt, 2008). In 1987, the World Commission on Environment and Development (WCED)<sup>1</sup> also known as the *Brandt* Land Commission, called for general efforts and new behavioral procedures at all levels and in the interests of everyone. The concepts of global cooperation and mutual supportive measures were published in a report entitled "Our Common Future." Despite the report by the Commission on the relative degradation of the environment, the participating members hope that if global commitment and engagement were to take place, we would have a safer and more prosperous future (Ghadery & Amiry, 2007). Therefore, environmental sustainability brings us economic, environmental, and social advantages. The economic advantages of environmental sustainability include cost reduction, differentiation in the business market (goods and services), entry into the new market, and brand improvement. The environmental advantages include energy savings, reduced waste, increased health and life expectancy, increased safety, reduced pollutants, and more resource storage. Finally, its social advantages include increasing social justice, order, and quality of life (Chou & Chou, 2012).

In regard to the above-mentioned matters, universities can achieve a sustainable environment through the implementation of the acceptance process of green information technology. Also based on Cooper and Mulla Green Preparation Model, the ability to

achieve sustainability through the support of Green Information Technology is possible for users, IT managers and organizations working in this field (Cooper & Mulla, 2010). This model includes five dimensions of attitude, politics, practice, governance, and technology. Four dimensions of green management, green attitude, green politics, and green education are presented for Green University according to Cooper, and Mulla Green Preparation Model, which presents the main dimensions of the capabilities of Green IT. Green University requires green management to make the decision for sustainable development (Hadady & Nosraty, 2017). University can create green politics thinking in order to reduce energy consumption among individuals through green policies, including advertising on the use of green information technology (Ahmadiyan & Jaliliyan, 2012).

According to the opinion of the scholars, the resolution of the environmental crisis depends on the reform of humans' teachings and the change of the attitude, insight, and knowledge of humans towards their own destiny and the surrounding environment. Therefore, Green University can play a key role in environmental protection with green education (Ahmady & Jabaryfard, 2016; Huckle, 1983) since knowledge is the basis of attitude (Abedi-Sarvestani & Shahvali, 2008). Green attitude is developed by teaching environmental values to individuals and increasing environmental knowledge (Mahdavy & Vaziry, 2010). Therefore, individuals learn to value themselves, the community and natural environment, and will work hard on preserving natural resources and environment (Tabatabaie et al., 2011). In this way, Green University helps to increase sustainable performance (Dagiliūtė et al., 2018).

In the pursuing section, the feature of each dimension of a Green University is presented.

1. Green Management: Green Management

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1. World Commission on Environment and Development,

attempts to expand the sustainability of the production process through the development of green-minded managers and establish the environmental performance of organizations and companies in order to minimize environmental damage by the participation of different groups (Hajizadeh & Ghasemy, 2012).

2. Green Attitude: Green Attitude provides the appropriate platform for promoting productivity, creativity, and innovation for optimum consumption (Hajizadeh & Ghasemy, 2012).

3. Green Politics: By adopting green policies, the organization minimizes the use of harmful materials, maximizes energy efficiency, and encourages the recycling of harmful environmental products (Mehrabiyan & Zohraby, 2014).

4. Green education: Universities have a high capacity for education and community culture development, through green education, they promote the culture of resource and energy management, reduce greenhouse emissions and, in general, encourage sustainable development (Tabatabaie, 2016).

Although several studies have been conducted on the concept of Green University, green information technology and sustainable development of the environment, no study has been conducted on examining the relationship between the three variables. Based on the results of the studies conducted in this field, the relations between Green University, green information technology, and sustainable development of the environment can be confirmed. Some studies conducted in relation to these variables are presented below.

Khalilian (2017), in his case study entitled "An Overview on Green Information Technology in Iran," addressed the various applications of green information technology in organizations, and Green Universities. Various activities were mentioned that could be used in this field in Iran. The study concluded that organizations with green thinking for macro decision-making of a

ministry, and collective environmental wisdom could help sustainability and the development of the environment.

Haddadi (2016) in a case study entitled "Strategies for green universities on the path to sustainable development of green management in universities", taking into account the current conditions of universities and sustainable development around the world, attempted to direct the attention of students, faculty members and staff to the global struggle with environmental change, hence, to take an important step toward sustainable development. The results showed that the advantages of green universities could be used and hoped for its sustainability only if they were implemented in the form of sustainable development macro programs and followed and ran by green management.

Fallahi (2016) in his study entitled "Green Information Technology and Its Role in Environmental Sustainability" examined the effect of green information technology on achieving environmental sustainability of Iran Radiator Factory and Manufacturing Process in Rasht Industrial Town. The tool used in this study was a questionnaire, and the data were analyzed by using smart PLS software. The results of the study showed that regulatory pressures, general concerns and cost reduction in the adoption of green information technology have a positive and significant effect, also cost reduction, the complexity of understanding and differentiation of services and products related to information technology have a positive and significant effect on achieving a green environment. Among these, the reduction in the cost of adopting green information technology and information technology has played a key role in achieving the green environment.

Maroni et al. (2018) in a study entitled "Environmental Performance of Universities: A Proposal for the Implementation of the University Structure as an Evaluation Parameter of Green Metric" studied the list of applications, the broadest university ranking

index, the green metric index, the focus on analyzing its features and its ability to evaluate. The study of the university structure could address issues of university sustainability. Finally, they proposed five new parameters (relating to soil use, reuse of existing buildings, public transportation, public green space, and the provision of near-university services) to integrate the green metric tools.

Dagilote et al. (2018) in a study entitled "Sustainability in Universities: Students' Perceptions of Green and Non-Green Universities" at two Universities of Vitalis Magnus (Non-Green University) and Kanas University of Technology (Green University) analyzed the difference in University Sustainability, environmental information, the role of the university in sustainable development, the students' attitude towards the automation of universities as green and the students' participation in sustainability. The results showed that, in general, no significant difference was found between sustainability aspects, but Green University students often described their university as being environmentally friendly. They received environmental information and often participated in sustainable activities in comparison with non-green university students. Using regression analysis, it was found that only university sustainability and student environmental information are significant in sustainability. This suggests that formal announcements and commitments should be implemented in specific activities at the university through information campaigns to help sustainability provisions in a more comprehensive manner.

Chou and Chou (2012) presented a valuable model for Green Information Technology in their library study entitled "Awareness of Green IT Value Model." In this paper, they outlined several components that affect organizations that assess the value of green

information technology. Green Information Technology Value Model is recommended for a relationship between Components of Knowledge, Translation, and Understanding of Green Information Technology and its effect on Environmental Sustainability. This value model is a framework for IT industry to achieve environmental sustainability.

Based on the literature and research background, it seems that Green University can play an important role in the sustainable development of the environment. Green information technology can also be linked to the sustainable development of the environment.

Regarding the fact that Green University is seeking to minimize environmental pollution and destructive natural cycle activities by adopting green information technology in its various daily activities (Zoroofchy et al., 2014), the significance of the present study is that Green University can enhance the sustainability of the environment so that we can have a better future.

Each scientific research is based on a theoretical framework that identifies the variables and the relationships between them. In the present study, considering Chou and Chou value model of Green Knowledge Technology, which can be used to describe the path to achieving environmental sustainability (Chou & Chou, 2012), and also according to Cooper and Mulla Green Preparation Model (Cooper & Mulla, 2010) the conceptual model of research was formed. The variables of the model were divided into three categories: criterion, mediator, and predictor. The key variable in this study is the sustainable development of the environment, the mediator variable is the acceptance of green information technology, and finally, the predictive variable of this study is Green University, which itself includes four dimensions of green management, green attitude, green politics, and green education.



By combining the theories and models mentioned above and using some existing relationships between them, the model and hypotheses of this research were shaped as follows.

Regarding the conceptual model of the research, the main hypothesis of the present study was the implementation of the role of accepting green information technology as a mediator in the relationship between the dimensions of the green university and the sustainable development of the environment. In order to examine this hypothesis, the following hypotheses were presented.

H1: Green management has a significant relationship with the acceptance of green information technology.

H2: Green attitude has a significant relationship with the acceptance of green information technology.

H3: Green politics has a significant

relationship with the acceptance of green information technology.

H4: Green education has a significant relationship with the acceptance of green information technology.

H5: Green management has a significant relationship with the sustainable development of the environment.

H6: Green attitude has a significant relationship with the sustainable development of the environment.

H7: Green politics has a significant relationship with the sustainable development of the environment.

H8: Green education has a significant relationship with the sustainable development of the environment.

H9: Acceptance of green information technology has a significant relationship with the sustainable development of the environment.

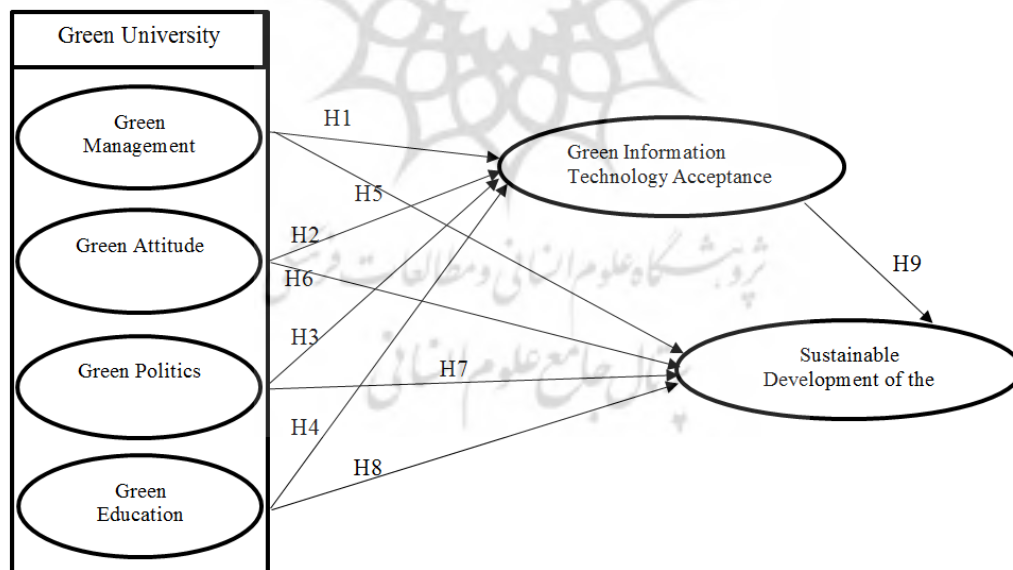


Figure 1. Conceptual model of research

### Research Methodology

From the purpose point of view, this study is described as applied research, and in terms of the nature of the method, it is descriptive-analytic because of the precise identification of the factors and variables related to the sustainable development of the environment;

as the study seeks to identify the type and amount of correlation among the variables, it is categorized a correlation type.

Following the award of UNESCO's Clean and Renewable Energy Sites to the Islamic Azad University of Science and Research Branch, the University succeeded in developing new

energy technologies as Green University in the Global Ranking List of Green Metric in 2017 (UI Green Metric). Hence, this study was conducted in the administrative environment of the Science and Research Branch of the Islamic Azad University of Tehran as a cross-sectional study. The statistical population of the study was composed of 300 employees of Research Branch of the Islamic Azad University of Tehran in 2018. The sample size was  $n = 168$ , which was determined by the Cochran formula (Hafeznya, 2010).

$$= \frac{NZ^2p \cdot q}{(N - 1)d^2 + z^2pq}$$

$$= \frac{300 \times 3/84 \times 0/5 \times 0/5}{(300 - 1)0/0025 + 3/84 \times 0/5 \times 0/5} = 168$$

$n$  = sample size

$N$  = statistical population size

$Z$  = percentage error of the acceptable confidence coefficient

$p$  = the probability of a trait in the community

$q = (1-p)$  = Likelihood of absence of a trait in the community

$d$  = the degree of confidence or optimum probability of accuracy

Usually,  $p$  and  $q$  were considered 0.5. The value of  $z$  is usually 1.96 and  $d$  can be 0.01 or 0.05, here 0.05 was considered.

After determining the total number of samples, random stratified sampling was done. A questionnaire was used as a tool for collecting information in survey research. In order to measure the variables of the green university, by studying the related resources, the original design of the questionnaire was prepared and developed with the cooperation of the experts and the content validity of the questionnaire was confirmed by the university professors.

In order to measure the variables of green information technology and sustainable environmental development, the standard questionnaire was used whose reliability was

confirmed by Cronbach's alpha coefficient (0.886), and its content validity was confirmed by experts and professors (Falahi, 2016 Taghavyfard, & Samady, 2014)

The five-option Likert scale was used to answer the questionnaire's measures. The validity and reliability of the questionnaire were assessed as follows. Cronbach's alpha coefficient was used to measure the reliability of the questionnaire. The Cronbach's alpha coefficient is a numeric value between zero and one that if the alpha is greater than or equal to 0.7, the reliability of the questions is optimum and questions have internal correlation (Alvany et al., 2008). Also in order to ensure that the questions, convey the intended concept to the respondent, the questionnaire was provided to the professors and experts, and in order to achieve convergent validity and correlation, compound reliability tests and mean of variance adapted were calculated. The compound reliability higher than 0.7 and mean-variance of at least 0.5 are the two prerequisites for convergent validity and structural correlation (Fornell & Larcker, 1981). In Table 1, Cronbach's alpha coefficient, which represents the reliability of the questionnaire, is reported for the compound reliability and the mean of the variance explained.

**Table 1:** Validity and Reliability Indices

Variable	Mean explained variance	Compound reliability	Cronbach's alpha
Green management	.578	.792	.74
Green attitude	.563	.768	.71
Green politics	.588	.822	.78
Green education	.591	.809	.75
Green IT	.665	.842	.80
Sustainable development of the environment	.613	.875	.83

In order to analyze the descriptive data, Cronbach's alpha coefficient was used, and for the normal distribution of research data SPSS software, version 25 was used. Also, in order to test the hypotheses, path analysis was used by using LISREL software, version 8/8.

### Research results

The use of parametric statistics is possible if the distribution is normal (Alvany et al.,

2008). So, Before testing the hypotheses and fitting the research model, we performed a test of the normal distribution of data. Kolmogorov-Smirnov test is a simple method for determining the selected statistical distribution. This test is another method for the consistency of a theoretical frequency distribution for the empirical information. The test for the assumption of this test are listed in Table 2.

**Table 2:** Kolmogorov-Smirnov test

Variable	Kolmogorov-Smirnov test	Significance level	The result of normal distribution test
Green management	.857	.158	Confirmed
Green attitude	.913	.127	Confirmed
Green politics	.746	.172	Confirmed
Green education	1.07	.096	Confirmed
Green IT	1.29	.081	Confirmed
Sustainable development of the environment	1.35	.069	Confirmed

**Table 3:** Correlation matrix of research variables

Variable	1	2	3	4	5	6
1 Green management	1					
2 Green attitude	.33**	1				
3 Green politics	.42**	.19*	1			
4 Green education	.55**	.38**	.43**	1		
5 Green IT	.49**	.62**	.56**	.37**	1	
6 Sustainable development of the environment	.59**	.21*	.47**	.45**	.51**	1
	P**<.01	P*<.05				

**Table 4:** Direct, indirect, and total relationships, and t value

Relationships	direct relationship	Indirect relationship	total relationship	T Value
on Sustainable development of environment				
Green management	.36**	.22**	.58	8.32
Green attitude	.25**	.14**	.39	6.15
Green politics	.23**	.16**	.39	5.92
Green education	.28**	.17**	.45	6.37
Green IT	.33**	-	.33	7.43
on Green IT				
Green management	.31**	-	.31	7.08
Green attitude	.19**	-	.19	3.16
Green politics	.27**	-	.27	6.15
Green education	.21**	-	.21	4.28
	P**<.01	P*<.05		

According to the results of Table 2 and taking into account the significance level obtained from each of the research variables, due to the fact that the values are greater than 0.05, we can claim that normal data was obtained from the questionnaire at 95% confidence level (Zare et al., 2010). Since the basis of path analysis studies is the correlation between variables, the correlation matrix of the research variables was first calculated and presented in Table 3.

From Table 3, the correlation between the predictive variables of the research i.e., Green management (0.59), Green Politics (0.47) and Green Education (0.45) with the dependent variable of the research is statistically significant at the level of 0.01. Also, green attitude variable (0.21) with the dependent variable of the research is statistically significant at the level of 0.05. Green information technology (0.51) as the mediating variable with the dependent variable of the research is statistically significant at the level of 0.01. Since in this study the primary goal was to present a structural model through using the path analysis method, it is necessary to examine the mediating and predictive role of variables i.e., the estimation of direct, indirect and total relationships.

Table 4 shows the direct, indirect, and total relationships and t values of the research variables. The LISREL software was used for path analysis, at the end of SS SC EF file, before Path Diagram command, enter the following command to compute the significance and indirect coefficients in the model and run the model.

According to Table 4, Green Management Variable ( $P < 0.01$ ,  $T = 8.32$  and  $B = 0.36$ ) had a direct and significant relationship with sustainable environmental development, green management component through the Green Information Technology variable had an

indirect relationship with the sustainable development of environment (0.22). Green management variable ( $P < 0.01$ ,  $T = 7.08$ ,  $B = 0.31$ ) had a direct and significant relationship with green information technology.

The green attitude variable ( $P < 0.01$ ,  $T = 6.15$ ,  $B = 0.25$ ) had a direct and significant relationship with the sustainable development of the environment, green attitude component through the variable of green information technology had an indirect relationship with the sustainable development of environment (0.14). The green attitude variable ( $P < 0.01$ ,  $T = 3.16$ ,  $B = 0.19$ ) had a direct and significant relationship with green information technology.

The green politics variable ( $P < 0.01$ ,  $T = 5.92$ ,  $B = 0.23$ ) had a direct and significant relationship with the sustainable development of the environment, green politics component through the variable of the green information technology had an indirect relationship with the sustainable development of environment (0.16).

Green politics variable ( $P < 0.01$ ,  $T = 6.15$ , and  $B = 0.27$ ) had a direct and significant relationship with green information technology.

Green education variable ( $P < 0.01$  and  $T = 6.37$ ,  $B = 0.28$ ) had a direct and significant relationship with the sustainable development of the environment, green education component through the green information technology variable had an indirect relationship with the sustainable development of environment (0.17). Green education variable ( $P < 0.01$ ,  $T = 4.28$ ,  $B = 0.21$ ) had a direct and significant relationship with green information technology. Green information technology variable had a direct and significant relationship with sustainable development of environment ( $P < 0.01$  and  $T = 7.43$ ,  $B = 0.33$ ).

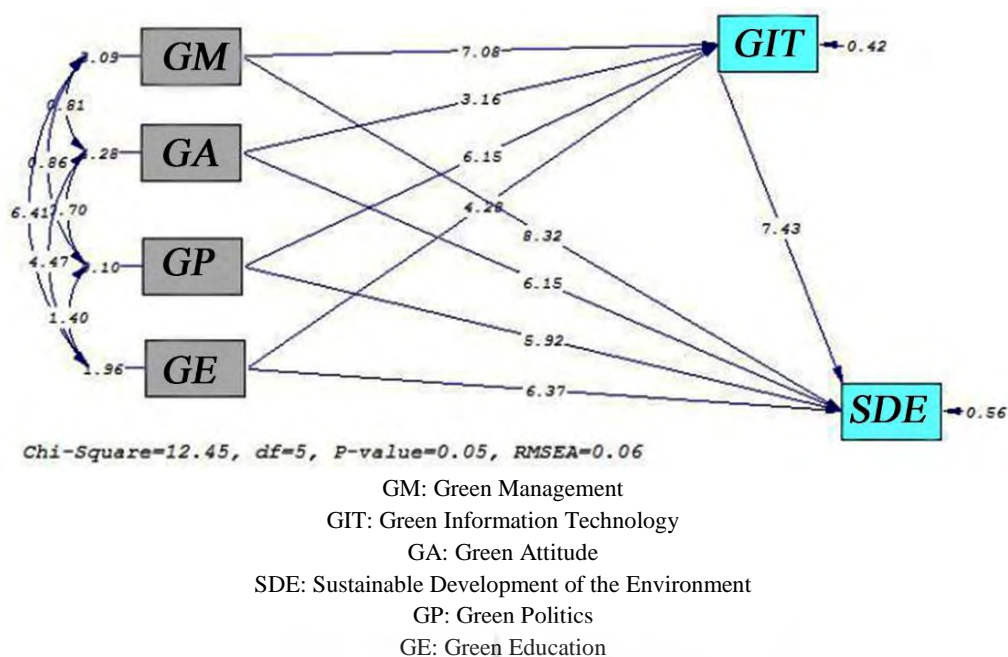


Figure 2 - The structural equation model at the significance level of the coefficients (t-value)

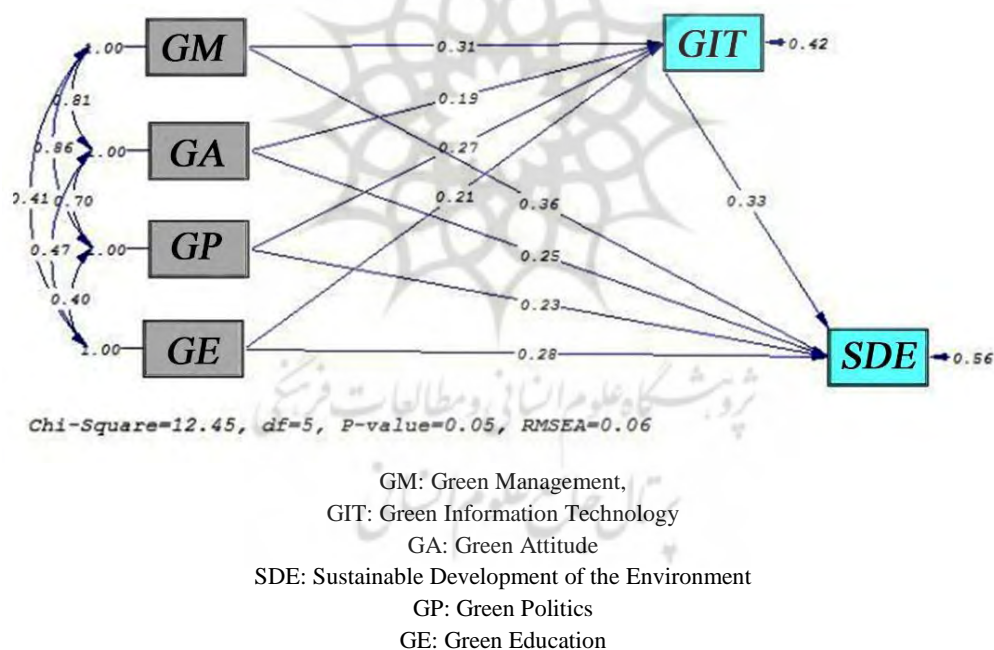


Figure 3 - Structural Equation Modeling in Standard Estimation of Path Coefficients

In the present study, nine indices were used to measure the fit of the model, namely, GFI<sup>1</sup>, AGFI<sup>2</sup>, SRMR<sup>3</sup>, CFI<sup>4</sup>, NFI<sup>5</sup>, NNFI<sup>6</sup>,

RMSEA<sup>7</sup>, PNFI<sup>8</sup> and  $X^2 / df$ <sup>9</sup>. The values of goodness indices of fit and the acceptable value of each fitness index are reported in Table 5 based on the indices provided by Klein (2015)<sup>10</sup>.

1 .The goodness of Fit Index  
 2. Adjusted Goodness of Fit Index  
 3 .Standardized Root Mean square Residual  
 4. Comparative Fit Index  
 5. Normed Fit Index  
 6. Non-Normed Fit Index

7. Root Mean Square Error Approximation  
 8. Parsimonious Normed Fit Index  
 9. Chi-Square relative to its degree of freedom  
 10 .Kline

In order to achieve the fitness indices and general evaluation of the model by LISREL software, on Path diagram page, from Output option, Fit Indices option is selected. This way, fitness indicators are displayed. According to Table 5, fit indices are at the optimum level.

**Table 5:** The model fit indices

Absolute fit indices	Value	Acceptable value
GFI	.92	Min.9
AGFI	.94	Min.9
SRMR	.04	Less than.05
X <sup>2</sup> /df	2.49	Less than 3
Comparative fit indices		
CFI	.95	Min.9
NFI	.93	Min.9
NNFI	.91	Min.9
Adjusted fit indices		
RMSEA	.06	Less than.09
PNFI	.88	Min.6

These indices indicate a very good fit of the model in the study population.

Figures 2 and three show fitted model path along with the estimated parameters (standard and significant values).

### Discussion and Conclusion

In this research, the relationship between the variables of the green university, the acceptance of green information technology and the sustainable development of the environment and the mediating role of the acceptance of green information technology in the relationship between green university and sustainable development of the environment at Islamic Azad University Science and Research Branch were investigated. Given the confirmation of all hypotheses at a 99% confidence level, the present conceptual model is a suitable model for predicting variables of the green university in relation to the sustainable development of the

environment. The results of the present study indicate that a positive and significant relationship is found between green management, green attitude, green politics and green education on the acceptance of green information technology and sustainable development of the environment At Islamic Azad University Science and Research Branch.

One of the primary goals of development is Green University, which is designed to reduce the impact on the environment caused by the exploitation of a large amount of energy, including electricity, oil, gas, water, chemicals and other resources of universities. As Fallahi (2016) acknowledged, Green University can take an effective step towards maintaining resources and sustainable development through raising awareness about sustainable development of the environment and educating students to become citizens responsible for the environment. Therefore, Green University primarily needs green management, which addresses environmental issues and crises. Green management, by implementing green policies such as investing and implementing research and development goals in the field of energy research and green management, supporting research and energy centers, holding training seminars, etc. can have a positive effect on the students and academics' attitudes. In this way, green education and the creation of a green attitude can bring about environmentally-friendly behaviors. In this regard, the use of green information technology has a significant effect on the development of the green university. Universities are among the centers that make extensive use of computer and information technology systems. By accepting green information technology, Green University will inform the community about the effect of information technology on climate and environmental change, minimize the use of harmful substances, and increase

energy efficiency for environmental sustainability. These results are consistent with the findings of Dagiliout et al. (2018), Marroni et al. (2018), Mohammadi (2017), Khalilian (2017), Zorofchi et al. (2014), and Cooper and Mulla (2010).

Therefore, the four dimensions of green management, green attitude, green politics, and green education as a driving force of moving towards a sustainable environment have a significant effect on the achievement of sustainable development goals, and Green University, through implementing Sustainable Development Model and the acceptance of Green IT to save energy and water, recycle paper, reduce greenhouse gases, etc. can achieve sustainable success and will play a widespread role in the development, advancement, transformation, and change in communities.

According to Zorofchi (2014), the choice of universities as education centers is an appropriate starting point of the implementation of the environmental protection program. These results are consistent with the studies of Khalilian (2017), Mohammadi (2017) and Waas et al. (2010).

The results of H1 and H5 test showed that the green management variable has a positive and significant relationship with the acceptance of green information technology and sustainable development of the environment; hence, confirmed the hypotheses. Green University, with regard to green management during the decision-making process, improves positive thinking at the university. As Haddadi and Nosrati (2017) acknowledged, green management, through the implementation of green politics, creates a green attitude in academics and contributes to the continuous development of environmental goals. These results are consistent with the findings of Tabatabai Yazdi (2016), Haddadi (2016) and Hajizadeh and Ghasemi (2012).

The results of H2 and H6 indicate that the green attitude variable has a positive and

significant relationship with the acceptance of green information technology and sustainable development of the environment. According to the results, these two hypotheses were confirmed. Green University, through educating managers with a green attitude, can help the acceptance of green information technology among staff and students and consequently help the sustainable development of the environment. As Mohammadi and Vaziri (2010) acknowledged, the most effective and important factor in environmental change is the human, and the behaviors we express in dealing with the environment around us are based on our awareness and attitude towards our cultural collection to the environment. These results are in agreement with the findings of Dagiliout et al. (2018), Khalilian (2017) and Cooper and Mulla (2010).

The results of H3 and H7 show that the green politics variable has a positive and significant relationship with the acceptance of green information technology and sustainable development of the environment. Therefore, these two hypotheses were confirmed.

As Ahmadian and Jalilian (2012) asserted, one of the main parts of green politics is the reform of the world order. Green politics calls for a new structure for nature conservation, and Green University can play an important role in the sustainable development of environment through the implementation of green policies for the use of green information technology and the development of individuals' green thinking because green thinking states that the sustained life of humans depends on the fundamental transformation of our relationship with the inhuman natural world and our social and political life. These results are consistent with the studies of Mehrabian and Zohrabi (2014), Cooper and Mulla (2010).

The study results of H4 and H8 test indicate that the green education variable has a positive and significant relationship with the acceptance of green information technology

and sustainable development of the environment. According to the results, these two hypotheses were confirmed. As acknowledged by Ahmadi and Jabbar Fard (2016), Green University, with effective education and a green approach, can keep pace with nature and maintain nature as it deserves, since one of the major duties of universities is to provide a suitable platform for new scientific and practical education in the pursuit of sustainable development goals. E-learning is one of the green education methods, and green education helps to solve environmental problems through the acceptance of green information technology using e-learning techniques. Because green information technology is the effective voice of IT in nature, these results are consistent with the study results of Mohammadi (2017), Zorofchi et al. (2014), Arasteh and Amiri (2012) and Hackel (1983).

Among the components of Green University, green management has the most direct (0.36) and indirect (0.22) relationship with the sustainable development of the environment. As Hajizadeh and Ghasemi (2012) stated, green management, the environmental performance of institutions, organizations, and companies are based on the participation of different groups in order to minimize the damage to the environment caused by sustainable consumption and production. Green University plays an important role in the sustainable development of the environment through the development of green managers.

Also, among Green University components, green management has the most direct relationship (0.31) with the acceptance of green information technology. As Khalilian (2017) stated, green-minded managers as intellectual leaders with Green Information Technology Solutions are beneficial to business and finally to the sustainable development of the environment.

In this way, taking into account the current state of the universities and the importance of sustainable development around the world, it is necessary to seek the attention of students, professors and staff for the global struggle with environmental changes. As Haddadi (2016) stated, one of the most valuable activities in the field of formal education in the country's comprehensive environmental education program is the plan for Green University.

The results of H9 indicate that the acceptance of green information technology has a positive and significant relationship with the sustainable development of the environment. According to the results, this hypothesis was confirmed.

As Fallahi (2016) and Alawipour et al. (2013) acknowledged, green information technology emphasizes the need for efficient energy consumption to reduce their effect on the environment; the reduction in energy costs had the greatest positive effect on the acceptance of green information technology and information technology to achieve the green environment. Therefore, in order to maintain and improve the quality of the environment consistent with sustainable development, proper use of information technology is necessary, taking into account all cultural, economic, political, and social aspects. These results are in agreement with the research findings of Mehrabian and Zohrabi (2014), Chou and Chou (2012), Watson et al. (2010) and Margesan (2008).

Based on the findings of this study, in order to succeed in the acceptance of green information technology at Islamic Azad University, Science and Research Branch, it is essential to hire managers with a green attitude, adopt green policies, change attitudes of individuals, as well as the amount and methods of education. Accordingly, Green University, with the acceptance of Green Information Technology, will provide a good



opportunity to educate individuals for sustainable development of the environment. Considering the importance of protecting the environment and reducing its degradation, it is necessary to educate and promote the environmental culture of individuals. Hence, some suggestions are made to strengthen the dimensions of Green University and the application of Green IT at universities.

- \* Awareness and education of students and staff regarding green information technology, and creating a green attitude among them to achieve environmental sustainability
- \* Formation of a committee for green policies and environmental regulations at the university
- \* Preparation and development of the

executive instructions of the current activities of the university by Green minded managers in order to achieve environmental goals

- \* Allocating budget to green information technology, consistent with informing individuals and using products that consume less energy
- \* Supporting and encouraging investment in eco-friendly technologies such as green information technology
- \* Establishing the necessary coordination between the units within the university by Green Information Technology in order to allow the joint use of data and information, reduce costs and increase knowledge efficiency.

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