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# Development of a 'green IT brand image sustainability model for competitive advantage'

**Anamica Singh**[1] · **Meenakshi Sharma**[1]

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**Abstract**
With the advent of environmental era in the aftermath of global warming, companiesare focusing on enhancing their environmental performance to strengthen their brandimage. Researches are being conducted on Green IT in current scenario and the term'Green IT' has received significant attention however very few has been done in India.Over the above little has been done to develop a framework integrating Green IT withCompetitive advantage, sustainable development, and green brand image. Thepresent study is a mindful effort in that direction. Based on exhaustive literature reviewa conceptual model has been developed to fill the research gap. The conceptual modelestablishes hypothesized relationship amongst four constructs: Green IT, Green brandimage, Competitive advantage and Sustainable development and develop sixhypotheses. The data is collected by means of questionnaire survey method from ITcompanies in NCR region of India. The empirical results reveal a positive relationshipbetween all the four constructs with the positive relationship between Green IT andCompetitive advantage mediated partially by Green brand image. The contributions ofthe paper lie in developing an original Green IT Brand Image Sustainability Model forCompetitive advantage (GITBISC model). The model is generic and empirically testedin NCR region of India for IT companies. The study has great social relevance andholds important managerial implications. The research results would guideacademicians, environmentalist, practitioners, policy makers to devise strategies thatwill help reduce carbon footprint on environment and contribute towards sustainabledevelopment.

**Keywords** Information technology · Green strategies · Environmental degradation

✉ Anamica Singh
anaamica.singh@yahoo.com

Meenakshi Sharma
meenakshi@bitmesra.ac.in

[1] Department of Management, Birla Institute of Technology Mesra, Off Campus Noida, Noida, UP, India

## 1 Introduction

Countries all over the globe are conscious about environmental concerns and policy makers are dedicated globally to control environmental degradation by making use of green strategies (Singh & Sharma, 2019a, 2019b; Sharma, 2018; Ho et al., 2013a, b). Researchers have highlighted that various new ICT-based innovations including cloud computing, usage of green technologies ensures reduced emission and waste with the help of ICT, which can help enhance the performance of sustainable productions (Archibald et al., 2020). Businesses are now taking a preventive attitude to safeguard the environment and encourage environmental responsibility to a greater extent by adopting environmentally friendly information technologies that will help efficient management of environment (Murillo Luna et al., 2007; Bose and Luo, 2011; Woeter et al., 2017).

Green IT is about efficient usage of communication and networking systems and effective utilization of monitors, personal computers, devices for storage and printers so that there is least possible or no detrimental effect on biosphere (Selvam, 2015). Green IT implementation is known to improve efficiency of energy, positively influence reengineering process of production and overall business (Watson et al., 2010), induce cost savings, enhance energy efficiency (GeSI 2008) and help in the utilization of technologies that are environment-friendly and gives lucrative return over invested capital (Inderst et al., 2012). Green technology has been suggested as one of the method stimulating sustainable development (Ghisetti et al., 2017). This means adopting and identifying environment friendly methods for growth by means of mounting new sustainable green innovations (Przychodzen et al., 2020). These innovations are designed for generation of high quality innovative products which may reduce environmental footprint (Hyung et al., 2019).

Despite growing importance of Green IT there exist a research gap in the recent literature in terms of studying the relationship between four major constructs viz. Green IT, Green brand image, Competitive advantage and Sustainable development. Although Chuang and Huang (2015a, 2015b) have studied the impact of green strategies on competitiveness of business and Singh and Sharma (2019a, 2019b) have established a positive relationship between Green IT, Branding and Sustainable development in their "Green Branding Sustainability Model," nothing significant has been done. The novelty of present study lies in developing a framework, explaining the relationship between the above constructs and testing it empirically for the first time. This research not only backs the existing literature on Green IT but also suggests better management of environmental practices.

The present study has developed GITBISC (Green IT Brand Image Sustainability Model for Competitive advantage) model as conceptualized in Fig. 1, which intent to fulfill the

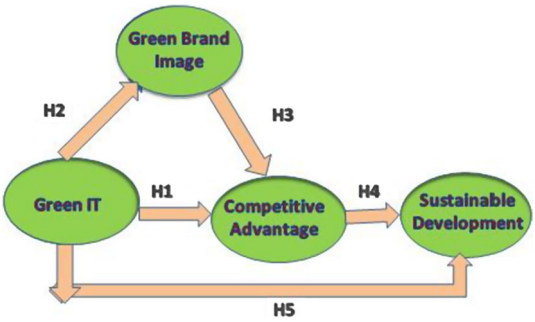


**Fig. 1** Hypothesized GITBISC Model

gaps in the research and has also proved it empirically. The GITBISC model in the study has been validated for Indian IT sector, but at the same time it is generic and can be applied to other sectors. The study will act as a guiding light for the environmentalist, policy makers, researchers and other stakeholders globally.

## 2 Review of literature and development of hypotheses

### 2.1 Green IT in India

India's requirement for investment in infrastructure to have Sustainable development by the year 2022 is about Rs.50 Lakh Crores or (US$ 777.73 billion) along with investment to upsurge the Green Energy Corridor Project capacity including other projects like wind and solar for Rs. 4,200 crores (US$ 648.75 billion). The requirement for electricity by 2040 is expected to be 280 TWh and government's ambition plan on green energy is expected to attract US$ 80 billion by domestic and foreign investors. India has a target to be achieved by 2022 attaining renewable energy to the limit 225 GW and has been ranked fourth as per Ernest & Young Renewable Energy Country Attractive Index 2018 (IBEF, 2018). An amount of 622.78 million US$ is allocated for year 2020–21 in the Union Budge for environment and climate change which highlights that the importance of Green IT is sure to increase in future (Aurobindo Pharma, Annual Report 2018–19).

### 2.2 Hypotheses development

#### 2.2.1 Green IT positively affects competitive advantage

Companies intensify their corporate reputation and increase their competitive advantage (Henderson and Venketraman, 1993; Luftman, 2004; Zeqiri, 2012; McGee, 2014). In highly demanding and dynamic environment, Green entrepreneurial orientation may positively impact a firm's performance (jiang et al., 2018). Constant execution in the field of Green IT and green initiatives has the capability to create advantage which can safeguard environment (Olson, 2008; Erek et al., 2011). Hartanto et al. (2017) found that usage of Green IT applications positively affects competitive advantage of the firm. Corbett (2010) believed that enterprises can develop competitive advantage with the usage of Green IT resources. Orsato (2009) also opined that with Green IT, volume of emissions can be reduced, more energy can be saved, and consistency can be developed between strategic framework of an enterprise and overall Green IT policy. Environmental initiatives of Green IT support low-cost strategies and facilitate differentiation strategies, thereby, creating Competitive advantage for sustainability (Zarella, 2008). Henceforth the first hypothesis formulated in the study is:

***$H_1$*** Green IT has positive effect on Competitive advantage of IT companies in India.

#### 2.2.2 Green IT positively effects green brand image

Brand image is a bunch of brand discernments that can be mirrored by its inter-relation with the customers (Keller, 1993; Wijaya, 2013). Brand image is inclusive of experiential, symbolic and benefits related with functions (Park, Jaworski and Maclnnis, 1986).

According to Chen (2010) green image of a brand is a set of observations that a customer keeps in his mind of a brand and connects to it if it is associated with green behavior, features and concerns.

Positive attitude of customer toward products that are green will certainly help them to relate to Green image of brand and green products will have favorable environmental image (Butt et al., 2016; Dibley & Baker, 2001). So, companies using Green IT concepts will create Green brand image. This leads to the second hypothesis as follows:

***$H_2$*** Green IT will positively influence Green brand image of IT companies in India.

#### 2.2.3 Green brand image positively effects competitive advantage

Green brand image design and symbolize green products and differentiates them from competitor's products. Enterprises are highly engrossed with branding because it provides edge over the competition and develop environment friendly reputation of the product (Greener design staff, 2009). Integrating the principles of green marketing into businesses is gradually being cited in the process of globalization of the economy and holds massive potential in attaining a sustainable competitive advantage (Kirilova & Vaklieva-Bancheva, 2017). The value of a brand surges with the enactment of principles of green marketing, which means that a company escalates its products value, attains competitive advantage, improves its and tends to explore new markets. This helps companies to get ready to deal with the environmental pressures among its stakeholders. The whole concept of brand building is linked to three major factors including green brand image that pursues fulfilment of the expectancy of green assurances, and credibility of a business (Moravcikova et al., 2017). Companies with Green marketing concept and Green brand image can be employed to build up differentiation advantages with the green products (Chen, 2010; Chen et al., 2006, 2018; Papasolomou et al., 2009). Green branding strategies are one of the important ways for organization to attain Competitive advantage (Aggarwal, 2004). Henceforth the hypothesis is postulated below:

***$H_3$*** Green brand image positively influences Competitive advantage of IT companies in India.

#### 2.2.4 Competitive advantage positively effects sustainable development

It has been discussed by researchers that various dimensions of sustainable development positively affect competitive advantage (Cantele & Zardini, 2018). Firms committing to long term initiatives of green marketing may bring a positive impact on profitability and competitiveness. Green initiatives can also be assumed as a great strategic tool for businesses for promoting sustainable competitive advantage (Papadas et al., 2018). However, the literature also supports the notion that business models that create competitive advantage also create sustainable development (Evans et al., 2018). Competitive advantage adopted by a company helps enhance the value, reduce environmental cost, enhance productivity and is a win–win solution to economic development through Sustainability (Haapanen and Tapio, 2016).Companies oriented toward market can be benefitted by integrating their sustainable activities to business strategies possessing positive impact on their competitive advantage (Pantouvakis et al., 2017). If a company adopts Green IT practices it increase their efficiency, reduce cost, enhance image of the company, leave less carbon

footprint on environment and contribute to sustainable development. This leads us to our fourth hypothesis as follows:

***$H_4$*** Competitive advantage positively influences Sustainable development of IT companies in India.

#### 2.2.5 Green IT positively effects sustainable development

Sustainability has emerged as a mega-trend (Lubin and Esty 2010) guiding toward low carbon emission society (Lee et al., 2019). Green technologies stimulate sustainable development by means of sources of growth for environmentally friendly technologies and developing new environmentally friendly industries (Ghisetti & Quatraro, 2017). Green knowledge management play a vital role in sustainable development, more creating, acquiring, exchanging and making use of knowledge, for green technologies, socio-economic and economic-innovations dimension of sustainable development (Abbas and Gsan, 2019; Aldieri & Vinci, 2018). Sustainable innovation helps companies to keep up with changing technologies (Walz et al., 2017). Currently education is added to above three dimensions as one of the important elements for the mankind to develop ethical awareness (Biasutti and Frate, 2017). The countries spending on Green IT and sustainability initiatives have observed a continuous growth and Green IT has a positive impact on Sustainable development (Sharma & Singh, 2013a, 2013b; Singh & Sharma, 2019a, 2019b).One of the best ways to achieve sustainability is through sustainable consumption, by making use of green practices and designs (Tseng, 2013).

Green IT refers to a mode of reducing the carbon footprint (Vella, 2018); enhancing sustainable consumption (Tseng, 2013) and a medium of improving the global sustainability (Haggar et al., 2019). Thus formulating the fifth hypothesis as below:

***$H_5$*** Green IT positively influences Sustainable development of IT companies in India.

This study hypothesizes that Green IT, Green brand image, Competitive advantage positively effects sustainable development. Further, this study postulates that Green brand image is mediating the relationship between competitive advantage and Green IT. Hence hypothesized as below:

***$H_6$*** Green brand image mediate the relationship between competitive advantage and Green IT.

### 2.3 Objectives of the study

1. To study the effect of Green IT on Competitive advantage of IT companies in India.
2. To study the effect of Green IT on Green brand image of IT companies in India.
3. To study the effect of Green brand image on competitive advantage of IT companies in India.
4. To study the effect of Competitive advantage on Sustainable development of IT companies in India.
5. To study the effect of Green IT on Sustainable development of IT companies in India.
6. To study the mediating role of Green brand image between Green IT and Competitive advantage of IT companies in India.

## 3 Research methodology

### 3.1 The collection of sample and data

The study is composed of quantitative research method and applied the survey method using questionnaire for verification of research framework and research hypotheses. Designing questionnaire and its items was done with the help of prior studies. The research focuses on IT companies in India with prior understanding of Green IT. Population of the study comprised of IT company employees in National Capital Region (NCR) of India. Selected employees from the companies were the managerial level employees having an experience of more than two years in the organization, who were implementing Green IT initiatives followed by their organization. National Capital Region includes Noida, Gurugram, Greater Noida and Delhi. All these cities are the hub of IT companies.

The instrument was previously tested the help of 25 experts in Green IT from the IT companies for determining content validity. Content validity was used to determine that up to what extent the items of the instrument used signifies the realm of the concept under investigation (Malhotra, 2008; Talavera, 2004).The experts who had experience of more than five years in their corresponding specialty were selected for establishing the content validity. The experts were approached and requested to review appropriateness and comprehensibility of the instrument. A pilot study survey was carried out with 50 IT professionals in total from all selected company to check overall questionnaire structure. The Cronbach alpha value was above 0.72, which is above 0.7(Nunnally, 1978) for total 17 items in the study. The sampling technique used is explained in Table 1.

NCR is the national capital region and has been occupied with multinational companies including the big IT companies. The selection of offices was done using random sampling in NCR. It has been noticed that all the IT companies selected for the study were having 2 to 5 offices in NCR.

The questionnaire was finalized consisting 17 items measuring four constructs: Green IT, Green brand image, Competitive advantage and Sustainable development. The details of 4 Constructs and 17 items are explained in Table 2.

The total questionnaires circulated through email and post were 1000. The questionnaires were self-administered and mailed to respondents across all the selected categories of specialty based on the Judgment sampling technique. The total of responses acknowledged were 656, of which 70 were incomplete and were sent back to the contact details. Of which only 14 questionnaires were received back. The study proceeded with response rate of 65.6% and a sample size of 600. Data were tested for missing value and it was ensured the data are clean and all questions were answered, the same has been testing using normality test as displayed in histogram Fig. 2. Standard deviation value of 1.505 and the bell curve denotes normal distribution of data (Glen, 2020).

**Table 1** Sampling technique used

| Stages | Selected items | Applied sampling technique |
|---|---|---|
| 1 | Selection of IT companies | Random Sampling (25 IT companies as per DQ online year, 2019) |
| 2 | Selection of offices | Simple random sampling (IT companies offices in NCR and Delhi) |
| 3 | Selection of employees | Judgement Sampling Exp. > 2 years |

**Table 2** Exploratory factor analysis

| Constructs | Items | Sources | Factor Loadings | Cronbach | KMO |
|---|---|---|---|---|---|
| Green IT (A) | Green IT initiatives | Singh. A and Sharma. M, 2019 | 0.797 | 0.859 | 0.813 |
| | Green IT management | | 0.621 | | |
| | Reusing IT | | 0.726 | | |
| | Regulating IT | | 0.671 | | |
| Green brand image (B) | My company represents environment commitments as best benchmark | Chen et al., (2010) | 0.757 | 0.842 | 0.848 |
| | The company is concerned with reputation of environment professionally | | 0.810 | | |
| | My company is well recognized for concerns about the environment | | 0.843 | | |
| | My company is worth trust for keeping promises relating to environment | | 0.803 | | |
| Competitive advantage (C) | Efficiency | Hosseni et al., (2018) | 0.714 | 0.873 | 0.860 |
| | Quality | Porter (1985) | 0.707 | | |
| | Innovation | | 0.807 | | |
| | Accountability | | 0.654 | | |
| | Distinctiveness | | 0.819 | | |
| Sustainable development (D) | Social sustainability | Kahn, (1995) | 0.866 | 0.910 | 0.825 |
| | Economical sustainability | | 0.767 | | |
| | Environmental sustainability | Biasutti and Frate, (2017) | 0.867 | | |
| | Education | | 0.869 | | |

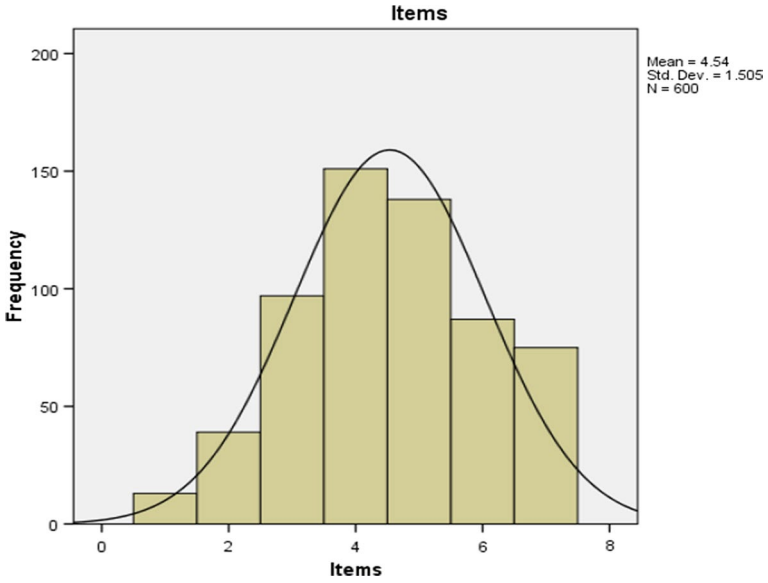


**Fig. 2** Normality test with standard deviation

### 3.2 Constructs measurement

The questionnaire consists of 17items, split into four parts for four constructs—Green IT (A), Green brand image (B), Competitive advantage (C) and Sustainable development (D), and they helped in developing the conceptual model Green IT Brand Image Sustainability Model for Competitive advantage (GITBISC model). The Likert scale measured the feedback, with options ranging "strongly agree (1)" to "strongly disagree (5)."

## 4 Data analysis and findings

Structural Equation Modeling (SEM) has been applied in the study for hypotheses testing along with AMOS version 20.0 to find the empirical results with the help of maximum likelihood method of estimation (MLE).

Exploratory factor analysis (EFA) is used in the study to understand what number of factors used in the study may represent the data best. Every variable measured was found to be correlated to every factor with estimate of factor loading. The exploratory analysis results are briefed in Table 2. Kaiser–Meyer–Olkin (KMO) is statistics measure for sampling adequacy, KMO value for all the four constructs were found to be more than 0.6 (Kaiser et al., 1974) which is considered ideal.

Common Method Bias was also evaluated with the help of Harman Single Factor test (Podsakoff et al., 2003). SPSS software was used where all the factors were constrained to a single factor. The percentage of variance explained as per un-rotated factor by single factor was 45% which is less than 50%. Variance explained of less than 50% confirms non-appearance of Common Method Bias in the study.

### 4.1 Measurement model

#### 4.1.1 Model fit estimates:

The measures used are discussed below:

- *Composite reliability (CR)* is a statistical tool used to check the internal consistency within pair variables and the value of the parameter should be more than 0.7.
- *Average Variance extracted (AVE)* it is another parameter used and is a variance measurement that explain variation in a construct due to error in measurement.

The two measures used for validity and reliability testing are Average Squared Variance (ASV) and Maximum Shared Squared Variance (MSV). For the discriminant validity to exist the values of AVE should be more than the two, i.e., MSV, ASV. Composite Reliability (CR) should be more that 0 0.7. Convergent Validity is tested with CR value more than AVE, with value of AVE greater than 0 0.5. Existence of Discriminant Validity is found with MSV less than AVE, and AVE more than ASV. Discriminant validity and Convergent validity results of the constructs are displayed in Table 3.

#### 4.1.2 CFA for individual construct

Confirmatory factor analysis (CFA) is used to ascertain the structure of factors of a set of observed variables. CFA is used for hypothesis testing and the results are summarized in Table 4.

#### 4.1.3 Structural model

The overall structural model is represented in Fig. 4. Overall model (full) indices shows that the results of the overall model are suitably acceptable with CFI = 0.988; AGFI = 0.934; GFI = 0.952.The model fit indices of the initial model are represented in Fig. 3 and structural model in Fig. 4. For the structural model to be a better fit few changes were made. As suggested by Bentlerp-value > 0.05; CMIN/df < 3; CFI > 0.90; AGFI > 0.80; were taken as appropriate.

The indices of initial model fit are summarized in Table 5. The revised model gave better results of model fit where $C_{\min}$/df = 2.619; $p$ value = 0.08; CFI = 0.958; AGFI = 0.894; GFI = 0.983, the results of both revised and initial models are summarized in Table 5.

The demonstration of the structural model is: F1 as Green IT, F2 as Green Brand Image, F3 as Competitive Advantage and F4 as Sustainable development. Thus, the results of initial model specified a model fit which is acceptable with values of $C_{\min}$/df = 2.619; $p$-value = 0.08; CFI = 0.958; AGFI = 0.894; GFI = 0.983.

The pathways Green IT to Competitive advantage ($\beta = 0.375$, $p < 0.001$) representing H1; Green IT to Green brand image ($\beta = 0.332$, $p < 0.001$) representing H2; Green brand image to Competitive advantage ($\beta = 0.180$, $p < 0.001$) H3; Competitive advantage to Sustainable development ($\beta = 0.800$, $p < 0.001$) (H4); and Green IT to Sustainable development ($\beta = 0.328$, $p < 0.001$) (H5), are said to be supported. The pathway Green IT to Green

**Table 3** Validity: Discriminant and Convergent

| Constructs | Construct reliability (CR) | Average variance extracted (AVE) | Maximum shared variance (MSV) | Average shared variance (ASV) | Discriminant validity (DV) | Convergent validity (CV) |
|---|---|---|---|---|---|---|
| Green IT | 0.859 | 0.521 | 0.429 | 0.184 | Yes | Yes |
| Green Brand Image | 0.842 | 0.513 | 0.421 | 0.177 | Yes | Yes |
| Competitive Advantage | 0.873 | 0.543 | 0.349 | 0.154 | Yes | Yes |
| Sustainable Development | 0.910 | 0.723 | 0.455 | 0.207 | Yes | Yes |

Source: Gakingston MS-Excel validity master output

**Table 4** Confirmatory factor analysis on individual factor

| Indices | Ideally | Green IT | Green brand image | Competitive advantage | Sustainable development |
|---|---|---|---|---|---|
| CFI | ≥ 0.95 | 0.99 | 0.99 | 0.99 | 0.96 |
| GFI | ≥ 0.95 | 0.99 | 0.99 | 0.98 | 0.95 |
| AGFI | ≥ 0.80 | 0.97 | 0.95 | 0.96 | 0.96 |
| $C_{MIN}$/df | < 3 | 1.58 | 2.45 | 2.29 | 1.27 |
| P value | ≥ 0.05 | 0.06 | 0.08 | 0.07 | 0.05 |
| RMSEA | ≤ 0.05 | 0.03 | 0.02 | 0.05 | 0.04 |
| P close | ≥ 0.05 | 0.48 | 0.16 | 0.32 | 0.12 |

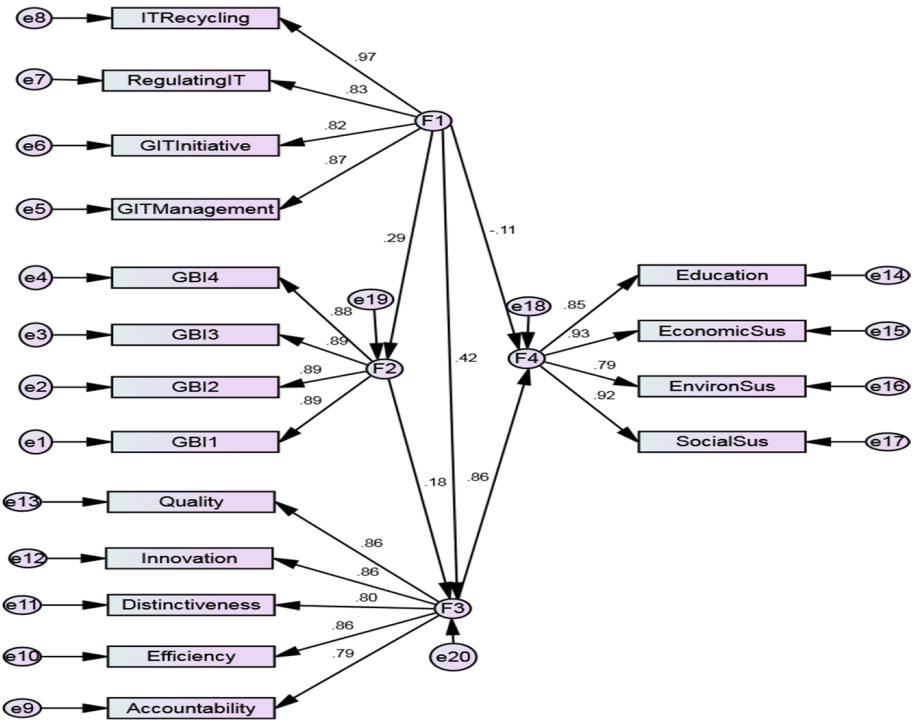


**Fig. 3** Initial Model

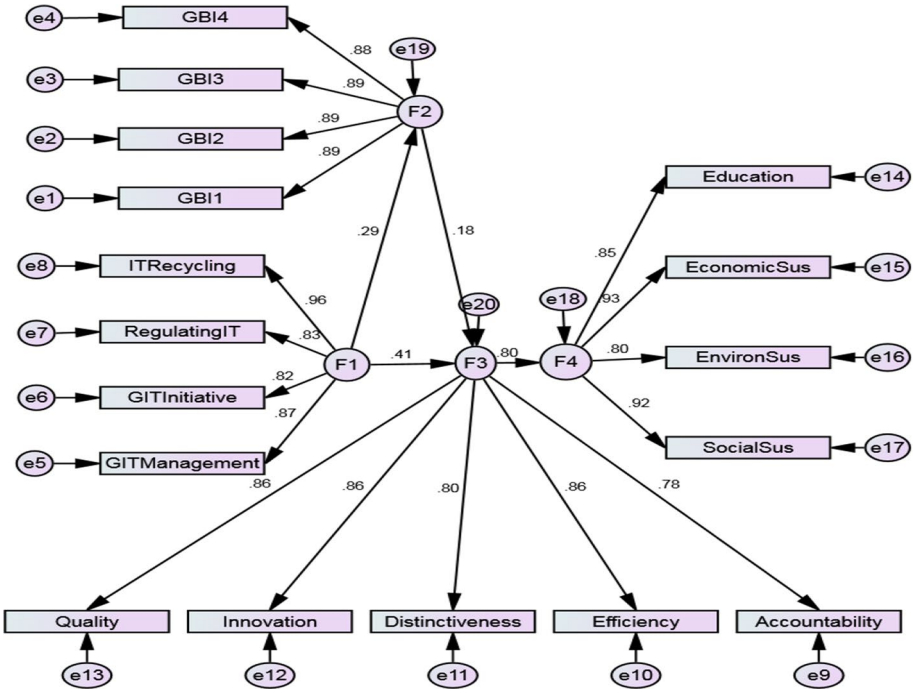


**Fig. 4** Structural Model

**Table 5** Model fit indices

| Indices | Ideally | Model fit indices (structural model) | Revised Model fit indices |
|---|---|---|---|
| CFI | ≥ 0.95 | 0.958 | 0.978 |
| GFI | ≥ 0.95 | 0.983 | 0.954 |
| AGFI | ≥ 0.80 | 0.894 | 0.899 |
| $C_{min}$/df | < 3 | 2.619 | 2.061 |
| p-value | ≥ 0.05 | 0.08 | 0.09 |
| P close | ≥ 0.05 | 0.07 | 0.08 |

Brand Image to Competitive Advantage, representing H6 ($\beta = 0.297$ and $p$ value $< 0.05$). All the pathways representing six hypotheses were supported.

## 5 Discussion

A goodness of fit test known to be Chi-square test was performed to test the data normality in the questionnaire consisting of 17 items and 4 constructs in total in the study. The analysis takes place at measurement level and structural level.

**H1** suggesting Green IT positively influences Competitive advantage of IT companies in India is suggested with regression weight of 0.375, $p < 0.001$, the relation is backed by the literature review suggesting the importance of Green initiative for competitive advantage (Erek et al., 2011, Rahman et al., 2014); **H2** suggesting that Green IT positively influence Green brand image (Zabadi, 2016) of IT companies in India is supported with 0.332, $p < 0.001$; **H3** indicated that Green brand image positively influences Competitive advantage (Magdalena, 2016) of IT companies in India which is supported by results with regression weight of 0.180, $p < 0.001$; **H4** representing that Competitive advantage positively influences Sustainable development (Joan, 2002, Nejati, 2010) of IT companies in India, which is supported as regression weight is 0.800, $p < 0.001$; **H5** suggesting Green IT positively influences Sustainable development (Singh & Sharma, 2019a, 2019b) of IT companies in India with regression weight of 0.328, $p < 0.001$, which is also supported.

Testing mediation hypothesis by testing direct and indirect effects of three constructs, Green IT, Competitive Advantage and Green Brand Image, are represented in Figs. 5 and 6. If Green IT has a direct significant effect on Competitive Advantage but reduced because some of the effect has shifted through mediating variable then it will represent "Partial

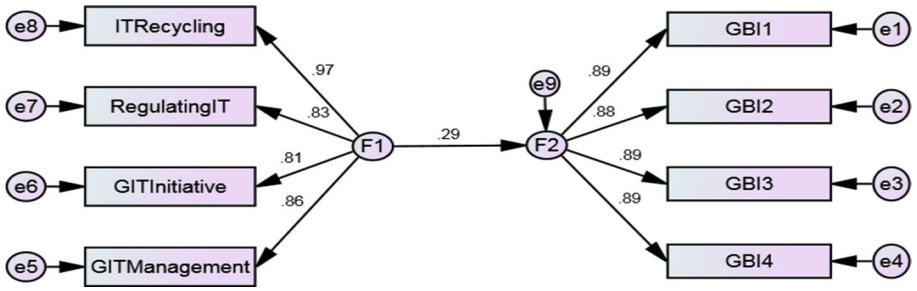


**Fig. 5** Independent variable → Mediator (Green IT- F1) → (Green brand image – F2)

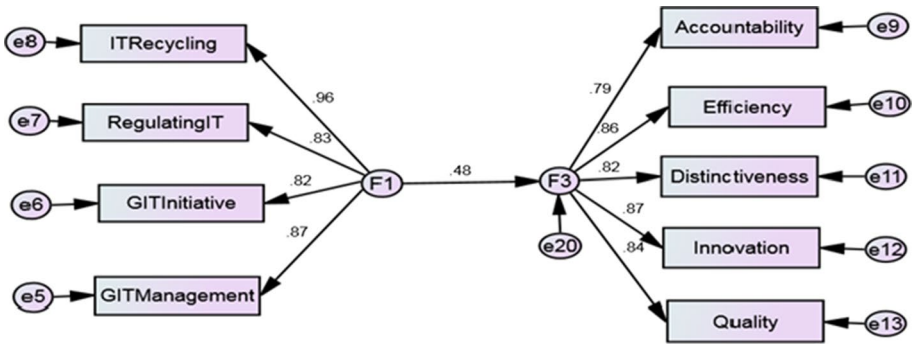


**Fig. 6** Modeling the direct effect of Green IT on Competitive Advantage

**Table 6** Standardized regression weights

| Variable | Variable | Estimate | S.E | C.R | *P* value | Result |
|---|---|---|---|---|---|---|
| Green brand image | <— Green IT | 0.332 | 0.118 | 2.805 | *** | Significant |

**Table 7** Direct effect of Green IT on Competitive Advantage

| Variable | Variable | Estimate | S.E | C.R | *P* value | Result |
|---|---|---|---|---|---|---|
| Competitive Advantage | < — Green IT | 0.375 | 0.083 | 4.523 | *** | Significant |

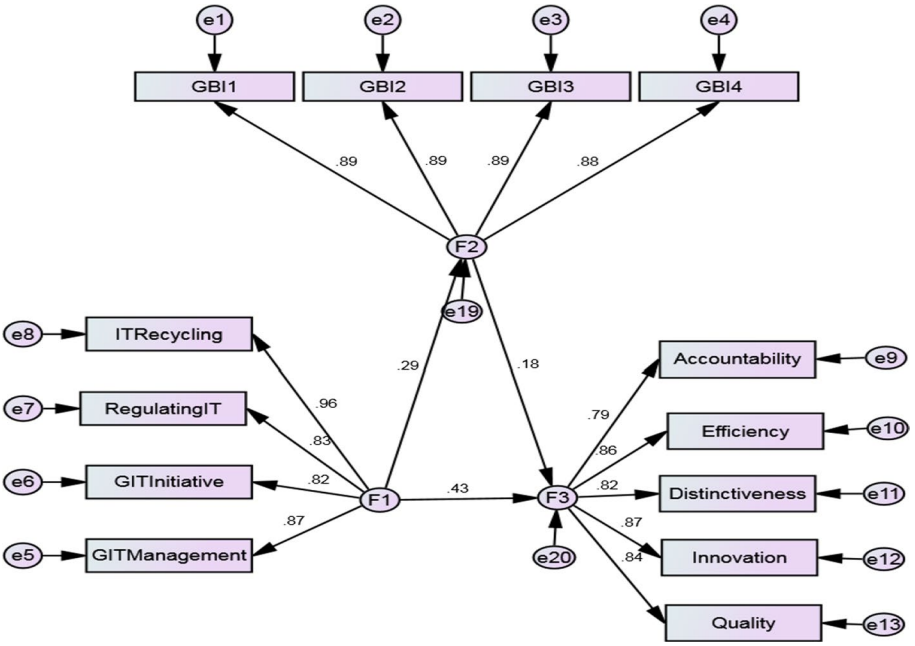


**Fig. 7** Modeling the Mediation effect

Mediation," whereas if the direct effect is no longer significant and reduced then it will be "Complete Mediation."

Fist condition is checked which states the independent variable (Green IT–F1) should affect mediator (Green brand image–F2) significantly, the same is represented in Fig. 5.

The relation proves to be significant fulfilling first condition of Baron and Kenny which states that Independent variable (Green IT–F1) effects mediator (Green brand image–F2). The estimates of direct effect are summarized in Table 6 with regression weight as 0.332, standard error of 0.118, C.R as 2.805 and $p < 0.001$.

Similarly second condition of Baron and Kenny was tested which states that that Independent variable effects dependent variable in the absence of mediator. Direct effect of Green IT on Competitive Advantage shows regression weight as 0.375 with p value < 0.001.

Figure 6 representing direct effect of Green IT on Competitive Advantage. The study has adopted Baron and Kenny's method for analyzing mediation effect.

The relation proves to be significant fulfilling second condition of Baron and Kenny which states that Independent variable (Green IT–F1) effects dependent variable (Competitive Advantage–F3) significantly in the absence of mediator (Green Brand Image–F2). Green IT influences Competitive advantage directly, and the effect is found

**Table 8** Indirect effect of Green IT on Competitive Advantage is significant with Mediator

| Variable | Variable | Estimate | S.E | C.R | *P* value | Result |
|---|---|---|---|---|---|---|
| Competitive Advantage | <— Green IT | 0.375 | 0.083 | 4.523 | *** | Significant |
| Green Brand Image | <— Green IT | 0.332 | 0.118 | 2.805 | *** | Significant |
| Competitive Advantage | <— Green Brand Image<br><— Green IT | 0.123 | 0.070 | 1.746 | 0.081 | Significant |

***Denotes p value < 0.001

**Table 9** Hypotheses testing results

| Hypothesis | Path coefficients | Estimates | *P* value | Supported? |
|---|---|---|---|---|
| H1 | Green IT →Competitive advantage | 0.375 | *** | Yes |
| H2 | Green IT→ Green brand image | 0.332 | *** | Yes |
| H3 | Green brand image → Competitive advantage | 0.180 | *** | Yes |
| H4 | Competitive advantage →Sustainable development | 0.800 | *** | Yes |
| H5 | Green IT → Sustainable development | 0.328 | *** | Yes |
| H6 | Green IT →Green Brand Image → Competitive Advantage | 0.123 | 0.08 | Yes (Partial mediation) |

***$p < 0.001$

to be significant (Beta coefficient 0.375. Also test for mediation is meaningful if the direct effect is statistically significant.

The estimates of direct effect are summarized in Table 7 with standard error of 0.083, C.R as 4.523 and $p < 0.001$.

Third condition for determining the effect of mediator was tested which suggests testing the effect of Independent variable on dependent variable in the presence of mediator.

Figure 7 is representing Mediation; Where Green Brand Image is acting as mediator between Green IT and Competitive Advantage. Regression weight estimates of Green IT to Competitive Advantage as 0.375 with standard error of 0.083, C.R as 4.523 and $p < 0.001$.

Mediating role of Image of Green Brand, i.e., hypotheses (**H6**) is tested by individually testing the direct as well as indirect effects with the help of Baron and Kenny (1986) method of examination of Green IT and Competitive Advantage. The hypothesis testing results are briefed in Table 8.

The **($H_6$)** Green brand image mediate the relationship between Competitive Advantage and Green IT is supported with beta coefficient of 0.123 and p value > 0.050 ($p = 0.081$).

It is 'Partial Mediation' here since Green IT (Independent variable) exerts some influence on Competitive Advantage through Green Brand Image acting as a Mediator and Green IT also exerts some influence directly on Competitive Advantage in the absence of Mediating Variable, i.e., Green Brand Image. Although the path coefficient of Green IT on Competitive advantage has reduced from 0.375 to 0.334 after Green brand image has entered the model, Green IT is significant in both cases which denote Partial Mediation.

Henceforth, all the six paths representing six hypotheses are significant and explained along with supporting results in this research.

Hypothesis testing results of all the hypotheses are noted in Table 9.

## 6 Conclusion

The study holds the potential with relevant theoretical implications and it makes substantial contribution to the existing accomplishments by highlighting the role of Green IT, and its usage as enhancing Green brand image for Sustainable development of Indian IT companies by creating Competitive advantage which has not been done before. The hypothesized GITBISC model has abridged the literature on Competitive advantage, Green brand image, Sustainable development and Green IT into managerial framework and has validated it empirically thus establishing positive relationship between Green IT, Green brand image, Competitive advantage and Sustainable development and mediation effect of Green brand image on Green IT and Competitive advantage for IT companies in India.

The study holds great social relevance for increasing awareness on Green IT in IT companies. Green brand image can not only make people aware about the Green IT but also helps people and companies correlate with it, thus creating Competitive advantage for the companies and sustainability for the society in the long run. This culmination of societal marketing concept will create win–win situation for both.

The study holds important managerial implications. If the companies adopt Green IT principles and are successful in creating Green brand image they can contribute toward Sustainable development in the long run. The present study will guide the policymakers to devise strategies that will reduce carbon footprint on environment and contribute toward sustainability. The GITBISC model may prove to be a breakthrough for IT companies as many companies are still struggling on the grounds of Green IT.

The GITBISC model has been validated for IT companies in NCR region in India. A pan India survey can help in better generalization of the results. The respondents of the current study comprised of only IT professionals belonging to the IT companies. A more exhaustive survey can be conducted by including other sectors/companies as well such as manufacturing, banking, consultancy, post offices, etc. for a more holistic approach. The findings may be different in other regions or countries. A cross-sectional analysis may lead to some interesting findings. Furthermore, a comparative study on private and government sectors taking this model may lead to interesting facts and results. The present study has tested Green brand image as a mediating construct between Green IT and Sustainability. Henceforth, it would be interesting to test the model with another mediator. The current research has not used moderation, which again provides a great scope for future researchers.

The study has explained placidly the increasing seriousness for implementing green strategies for environmental concern and how Green IT Brand Image Sustainability Model for Competitive advantage (GITBISC model) can lead to development which is sustainable. The results of the research are detailed, interesting and relevant for further instigation for researchers, environmentalist, academicians and practitioners including policy makers. This research will prove to be a breakthrough for future research and can be used as one of the strong references by scholars, researchers and authors. The research results blend very well with the present global digital revolution and 21$^{st}$ Agenda of International Declarations which asserts that as of now priority of any nation should be sustainability.

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