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Environment sustainability through sustainability innovations

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Abstract
The present study investigates about the diffusion of sustainability innovation practices in the hotels/resorts of Himachal Pradesh and J&K which are two very crucial states of India, tourists-wise and location-wise. The paper investigates about the percentage of the hotels that have implemented such practices and also the major reasons behind adoption or non-adoption of such practices. To investigate the responses, the research uses Rogers' theory of diffusion of innovation which hypothesizes that adoption of such practices depends upon characteristics of the innovation and that of the innovator. The study has been conducted in two northern states of India, viz. Himachal Pradesh and J&K, in 120 hotels belonging to different districts of the two states as these two states represent more than 50% of the northern Himalayan region of India. A study also tries to develop a new instrument to measure environmental sustainability innovations measures in Indian context. Relationships have been established with the help of ANOVA, correlations and regression analysis. The results of the investigation have come out with the findings that the high level of environmental opinion leadership of hotels/resorts is the strongest predictor of the adoption of sustainability innovations. The perceived relative advantage and the trialability of the hotels/resorts are only partially correlated. These results can be extremely useful for the government, innovators, change agents, as well as suppliers of the hotel industry of India and can also be a guide on how to further diffuse sustainability. This study provides a valuable contribution to the emerging fields of hotel sustainability and diffusion of sustainability innovations. Adopting the suggested innovative practices can dramatically transform the way in which the hotels/resorts offer their services and products and hence play a leading role in building a progressive society that promotes a lifestyle that is sustainable.

Keywords DIT · Environment sustainability · Innovation · Hotel industry · Innovation characteristics

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1 Introduction

India is a large market for travel and tourism. It offers a diverse portfolio of niche tourism products and has been recognized as a destination for spiritual tourism for domestic and international tourists. Total contribution by travel and tourism sector to India's GDP is expected to increase from US$ 136.3 billion in 2015 to US$ 275.2 billion in 2025. Travel and tourism is the third largest foreign exchange earner for India. A sum of US$ 1.76 billion was earned under foreign exchange through tourism during the month of September 2016 (IBEF 2016). Just like there is a flip side of most good things, tourism has a similar flip side too, which is its inundated and unchecked growth and its toll on the natural environment.

With the growth of tourism, the term like over-tourism has come into picture (Song et al. 2020) showing that the impacts of tourism development have become more and more visible in society. A large hospitality infrastructure in the form of hotels, resorts, lodges, restaurants, markets and townships had sprung up to meet up with the growing people demands (Karpagavalli et al. 2015). The general pattern of tourism is growing, but the adverse impacts of tourism are dangerously on the rise in many parts of the world, inviting unforeseeable and unexpected events particularly the degradation of the environment, fast depletion of natural resources, adverse effect on biodiversity and ecological balance. It has also been said that the more a place a dependent on tourism, the more impacts it will feel (Jo 2020; Aftabuddin and Jain 2017).

As per Indian Tourism Statistics (2019), Himachal Pradesh ranked 18th, while J&K ranked 17th in number of domestic tourists visits and Himachal Pradesh ranked 14th and J&K ranked 19th in number of international tourists visits among the 36 states and union territories of India. Therefore, the Himalayan states like Himachal Pradesh must pay attention to the lessons that Uttarakhand disaster offers. The recent Uttarakhand 2013 disaster has raised many important questions. Whether the disaster was an unprecedented natural phenomenon or was it the results of intense human activities. The answers to these questions include the climate change impact, anti-environment development (deforestation and hydro-electrical projects), ill-planned tourism, Shoddy road buildings, illegal building construction and river-bed sand mining. This ill-conceived expansion of tourism in Uttarakhand has magnified the death toll (Chopra 2014; HPSDMA 2012). Such recent incidents have raised the concern for environmental sustainability (Mitra and Khan 2017; Dunlap et al. 1993; Jo 2020).

The Kedarnath (Uttarakhand) disaster which killed people in thousands and caused economic loss in billions is one of the biggest disasters that the country has ever witnessed. It is one of the examples of destruction due to unplanned and unsustainable growth of constructions in the state (Aggarwal 2020). For the states of Himachal Pradesh and J&K too, it is a call of time. Though there are a number of initiatives taken by government to protect the environment, it is also the duty of the industries themselves, to take initiatives to protect the environment. Awareness about the environment friendly practices can further enforce the top management and owner of the companies to adopt these practices. An increase in the level of awareness will be helpful in the better enactment of laws related to environmental protection. This study will help in identifying the rate and reasons of adoption of sustainability innovation and will provide guidelines for the hotel/resort industry in the state.

This study is first of its kind and is carried out to check the impact of diffusion of innovation theory indices with sustainability indices in Indian scenario. Earlier only few such

attempts have been made in other parts of the world making this research truly relevant and crucial in Indian as well as world context. The present study uses Everett Rogers' diffusion of innovation theory, which has been the foundation of many studies worldwide, to understand the adoption of sustainability innovations. This study utilizes six characteristics, four related to innovation and two to adopter which have also been proposed in earlier studies to study sustainability diffusion in the hotel/resort industry of Himachal Pradesh (HP) and Jammu & Kashmir (J&K) as both lie in the lap of Himalayan ranges of India. Himachal Pradesh covers 10.43% share of geographic area in the Indian Himalayan Region (IHR), which is highest after J&K (41.65%), thus making these two places the ideal places to be selected for the present study (ENVIS, Monograph3).

Only a limited number of attempts have been made earlier, internationally (e.g. Le et al. 2006; Smerecnik and Anderson 2011) and none in Indian context that have tried to explore sustainability practices and innovation process in the hotel industry using DIT. Even those that are there have mostly studied in the areas of telecom, teaching or banking (Kapoor et al. 2013; Wani and Ali 2015). Hence, the present work utilizes this research gap and adds new insight into an under-researched area.

2 Literature review

2.1 The context of sustainability

The term 'sustainable development' was coined in the 1980s in the Brundtland report (Our Common Future: Report of the world commission on Environment and development) as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The scholars of tourism development have also embraced the idea of sustainable development; however, being in its nascent stage, its scope is still being widely discusses and researched (Sharpley 2000; Butler 1999; Charter and Clark 2007).

Involving businesses for escalating sustainability and hence communicating its significance to the society is crucial as they play a major role in managing the economy by producing goods and services from the inputs received (Smerecnik and Anderson 2011). Innovations in the area of sustainable development concern the evolution of organizational philosophy and values as well as products, processes or practices in order to achieve the specific objective of creating and achieving social and environmental value, in addition to economic benefits (Adams et al. 2016; Szekely and Strebel 2013). Andriate and Flick (2008) and Arowoshegbe and Emmanuel (2016) have explained the concept of triple bottom line: social equity, ecological integrity and financial profitability and how business enterprises are using this concept to their advantage. Effecting the transformation to ecological, social and financial sustainability requires more than adding a collection of sustainable practices and tools to an organization (p. 118). Managers of firms are increasingly realizing that their ecological and financial stability will jeopardize if the depletion of the non-renewable resources on which they depend continues in the same fashion (Schaltegger et al. 2016).

The present work focuses on sustainability in hotels/resorts because the tourism industry highly relies on the natural resources for its survival and growth (Edwards 2005; Freeman et al. 2000; Kongbuamai et al. 2020) and has significant environmental, cultural, social and economic impacts, mostly in an adverse manner (Mowforth and Munt 2003; Asadi

et al. 2020). In a study related to tourism industry, it was found that hotels/resorts need the greatest amount of energy (Bohdanowicz 2005; Cingoski and Petrevska 2018). Thus, sustainable practices will not only better the environment but are also imperative for hotels to deliver superior performance; this has been recently realized by many hotel managers and they do understand that their growth and economic sustainability depend upon their environmental policies (Erdogan and Baris 2007, p. 604). Studies indicate that hotels/resorts occupying an innovative demographic tend to show an increased adoption of sustainability initiatives (Smerecnik and Anderson 2011).

2.2 Innovation and sustainability

In the past decade or so, sustainable development has been one area that has received an ever-growing and undisputed attention whether we talk of governments, industry or academics (e.g. European Union 2014; United Nations 2016; Silvestre and Ţîrcă 2019). While going through the different literature on sustainable development, it can be noted that role of innovation is key in enhancing sustainability (Silvestre and Silva 2014a) and it has also been acknowledged that sustainable development should be managed via innovation-centric methods (Silvestre 2015a, b). The changes bought by innovations to our lives are all pervasive (Huisingh et al. 2013), and it can also be a force to bring much required changes in the institutions, organizations, regions, communities and hence countries to implement sustainable development initiatives (Silvestre 2015a).

Despite knowing all this, movement towards sustainable growth has been very slow, which calls for a more aggressive initiative and investment from different stakeholders to look for innovative methods to resolve challenges associated with sustainable development (Kibet and Korir 2013). This is because sustainable innovations that have been adopted and are being continuously followed have helped organizations achieve ever improving social, economic and environmental performance (Smerecnik and Anderson 2011; Silvestre 2015b). Besides all this, another element which is crucial is willingness on the part of businesses, i.e. the management and the staff of organizations (Silvestre and Ţîrcă 2019).

2.3 Hotel and resort sustainability

Apart from other reasons like competitive advantage, the hospitality sector also has a stake in protecting the environment, since it depends upon it. The pressure for improved environment performance, enforcement of environmental regulations from government, institutional pressures, other environmental organizations and consumer demand for environment friendly program has forced the hotels to preserve the local environment and other perceived benefits associated with it (Erdogan and Baris 2007; Mbasera et al. 2016). This preservation of local environment will lead to a clean environment which is important for the development of tourism and hotel industries. Therefore, hotels and resorts are adopting environment management for the adoption of sustainable programs such as reducing energy consumption, recycling, and composting food scraps to reduce solid waste and minimize energy costs (Trung and Kumar 2005; Maynard et al. 2020).

There are many international organizations that had already integrated sustainable development concept and build their strategies around it. Few of the leading firms include hotel and resort companies like Accor, Fairmount, Hilton, Kimpton, Marriott and Taj hotel group. For example, Kimton's hotel environmental protection initiative includes creation

of an eco-friendly room which offers amenity dispensers, efficient lighting and motion sensors. Kimpton hotel also assigned new revenues to its environmental program (known as EarthCare). This program included more than 40 environmentally friendly practices that encourage the preservation of water, land, air and energy. It includes in-room recycling, the introduction of organic foods and beverages into hotel mini bars. These practices resulted in replacement of toxic-cleaning chemicals with non-toxic alternatives and saving tree by using recycled paper (Houdr´e 2017).

There are some research-based evidences in hotels/resorts though inconclusive displaying relationship between adoption of the sustainable practices and their performance. If we segregate the literature, it reveals that evidences range from positive relationship (Kassinis and Soteriou 2003) at one end to no significant relationship (Cortés et al. 2007; Rahman and Dennis 2014) at the other end. Some literature reveals the evidence of the positive performance implications of environmental management measures, including cost reductions, resource savings, customer retention and loyalty, and improved employee morale in hospitality industry (Kassinis and Soteriou 2003). Cornell Hospitality Report has found a modest link between environmental sustainability and guest satisfaction. However, the same study finds an increased customer willingness to participate when hotels offer incentives, such as loyalty program points, for participating in environmental programs (Smith et al. 2015).

A study in province of Alicante (Spain) shows that the degree of environmental proactivity achieved by hotels does not strongly impact their organizational performance (Cortés et al. 2007). Another study reveals that guest loyalty is affected by resort demographics, environmental practices and quality of service. These findings are useful for policymakers and resort owners to enhance their understanding on customer service (Yusof et al. 2015). Studies also exist that display the impact of non-sustainable practices on climate change in the form of decreased snowfall resulting in warmer winters (Nandy et al. 2006; Horobin and Long 1996) which may cost the industry dearly. It has further been opined that progressive research is required to explore factors that may influence the adoption sustainable policies in the industry (Charter and Clark 2007). Hence, this study tries to fill this gap by identifying the factors and explain the factors that are crucial to the adoption of sustainable practices.

2.4 Diffusion of innovation theory (DIT) and hotel/resort sustainability

DIT defines innovation as an idea, practice or object that is perceived as new by an individual or other unit of adoption, and the characteristics of an innovation, as perceived by the members of a social system, determine its rate of adoption (Rogers 1995). An estimated 5200 studies have been conducted in the field of diffusion, and this number still grows to continue. DIT has been used successfully in many fields including communication, agriculture, public health, criminal justice, social work and marketing. However, a limited number of research works have addressed the same in the hotel industry as an innovation process by using DIT (Hornga et al. 2017; Smerecnik and Andersen 2011; Le et al. 2005; Hollenhorst et al. 2006). As sustainability is being practiced in more and more industries, DIT can be a suitable approach for the present study involving the adoption of hotel/resort sustainability.

Rogers (2003) postulates that characteristics of innovations, as perceived by individuals, help explain their different rate of adoption which are relative advantage, compatibility, complexity, trialability and observability. Past research indicates that they are the most

important characteristics of innovations in explaining rate of adoption (explaining 49 to 87% of variance in adoption). Studies on diffusion of innovation recognize that innovation is embedded in socio-geographic contexts, and it affects the perception of people because of situations, which in turn shape the innovativeness of individuals and places (McEachern and Hanson 2008). Most of the earlier work related to diffusion of sustainability practices have focussed their attention on either culture or society (e.g. McEachern and Hanson 2008) or maximum up to the extent of diffusion of sustainability-related policies (Miska et al. 2018). Very few studies have looked into the innovation adoption on sustainability of hotels. These include the diffusion of environmental sustainability innovations (ESI) in North American hotels and ski resorts (2011) and environmental management: a study of Vietnamese hotels (2006) which seeks to understand what sustainability innovations are being adopted and the variables affecting the rate of adoption.

2.4.1 Characteristics of innovations

DIT dominated the theory and practice of agricultural extension system all over the world for almost half a century (Peshin et al. 2009). In public health, DIT has been used to accelerate the adoption of important public health programs that typically aim to change the behaviour of a social system. The following are the characteristics of innovation:

2.4.1.1 Relative advantage (RA) In Rogers's view, the relative advantage is "the degree to which an innovation is perceived as better than the idea it supersedes" (Rogers 1995). If an individual perceives the innovation as advantageous, then the chance of its rate of adoption is going to be more rapid. The literature signals that adoption of such practices is positively affected by their relative advantage which includes cost saving, profitability, employee's satisfaction and morale, business image benefits, product/service market innovation, effective risk management, new source of revenue and cash flow and enhanced stakeholder relation (Bohdanowicz et al. 2011; Berns et al. 2009; Chou et al. 2012).

2.4.1.2 Compatibility "Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters." (Rogers 2003). It has been said that the consistent an innovation is with the prevalent values, the more are the chances of its adoption in hotels (Le et al. 2006). A few values have been identified recently that have proved to be motivating the adoption rate of innovations related to sustainability: personal values, moral values, environmental values and top manager's ethics or support (Salzberg 2016). Adopting sustainability innovations at hotels also depends on the technology and organization vision.

2.4.1.3 Complexity or simplicity Rogers (2003) defines complexity as the reverse of simplicity is the "the degree to which an innovation is perceived as difficult to understand and use". Some innovations are readily understood by most members of a social system; others are more complicated and will be adopted more slowly. In general, new ideas that are simpler to understand will be adopted more rapidly than innovations that require the adopter to develop new skills and understandings. It has been suggested that the more the simplicity is followed in communicating about the innovations, the better are the chances of its adoption (Smerecnik and Andersen 2011).

Tornatzky and Klein (1982) carried out a meta-research of seventy-five publications about perceived attributes and rate of adoption. Relative advantage and compatibility were usually, but not always consistently, related to rate of adoption in a positive direction, and complexity was negatively related to rate of adoption, but exceptions have been found (Yusuf Kimutai Kibet and Korir 2013).

2.4.1.4 Trialability Rogers' (2003) trialability in innovation adoption theory is "the degree to which an innovation may be experimented with on a limited basis". New ideas that can be tried on the instalment plan will generally be adopted more quickly than innovations that are not divisible. An innovation that is trailable represents less uncertainty to the individual who is considering it for adoption, as it is possible to learn. The trialability of an innovation, as perceived by members of a social system, is positively related to its adoption. However, there is a counter study that did not find any association between the two. The reasons quoted for the same are: firstly, to apply sustainability innovations partially or temporarily is very cumbersome and the second being managers' suspicion, which forces them to go for extensive research about an innovation before applying and hence implementing only when it proves itself to be advantageous (Smerecnik and Anderson 2011, p. 188)

2.4.1.5 Observability According to Rogers theory observability "is the degree to which the results of an innovation are visible to others". The easier it is for individuals to see the results of an innovation, the more likely they are to adopt. Such visibility stimulates peer discussion of a new idea, as friends and neighbours of an adopter ask him or her for innovation-evaluation information about it. Adoption of an innovation depends on the observability of its results (Le et al. 2006). But since quick results of most of such sustainability innovations for verifications are not often visible, observability seems to be an inappropriate characteristic for this study (Smerecnik and Anderson 2011, p. 174)

2.4.2 Characteristics of adopters

Besides characteristics of innovation, Rogers (2003) also defined the adopter's characteristics that affect the adoption rate of such innovations. The present study utilizes the following two adopter characteristics:

2.4.2.1 Innovativeness Innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than the other members of a system (Rogers 2003). Adoption of sustainability innovations is affected by the characteristics like size, demographics, ownership, etc., of a hotel/resort (Tzschentke et al. 2008; Erdogan and Baris 2007; Le et al. 2006). It has also been suggested that future researches should also focus on classifying the types of innovations w.r.t. size of the organizations (Le et al. 2006).

2.4.2.2 Environmental opinion leadership (EOL) According to Rogers (2003), opinion leadership "is the degree to which an individual is able to influence other individuals' attitudes or overt behaviour informally in a desired way with relative frequency". It is a type of informal leadership, rather than a function of the individual's formal position or status in the system. Opinion leadership is earned and maintained by the individual's technical compe-

tence, social accessibility, and conformity to the system's norms. Much research indicates that when the social system is oriented to change, the opinion leaders are quite innovative, but when the norms are opposed to change, the behaviour of the leaders also reflects this norm.

3 Hypotheses

Based on the literature presented, the following seven hypotheses can be supported (Fig. 1):

(H1) The RA of environmental sustainability innovations (ESI) is positively correlated with the adoption of ESI.

(H2) The compatibility with current practices of ESI is positively correlated with their adoption.

(H3) The simplicity of ESI is positively correlated with the adoption of ESI.

(H4) The degree to which ESIs are triable is positively correlated with their adoption.

(H5) EOL is positively correlated with the adoption of ESI.

(H6) The resort innovativeness is positively correlated with the adoption of ESI.

(H7) The combined variables of the innovation and adopter characteristics will significantly predict the adoption of ESI.

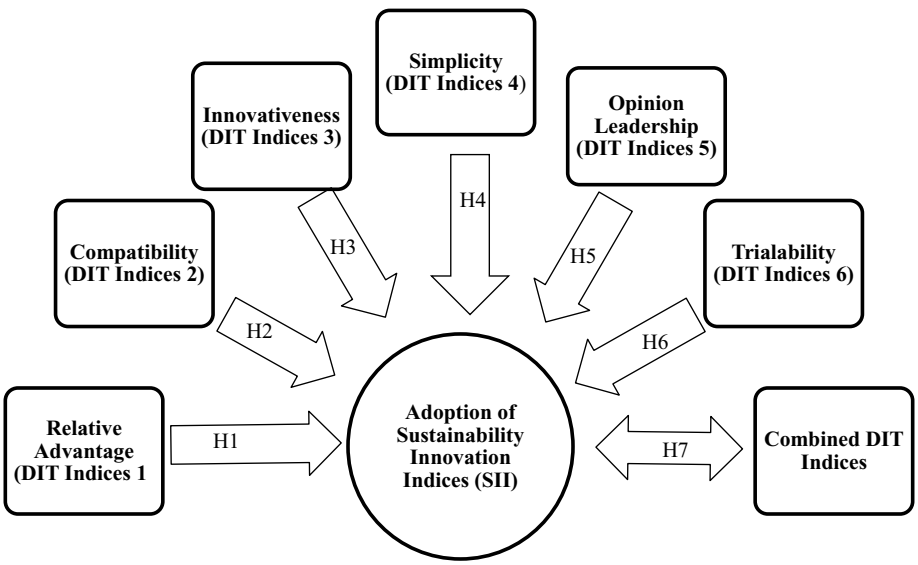

Fig. 1 Model describing all hypothesis

4 Materials and methods

This section is divided into three major sections, viz. the research design, the sample and the data collection. Data collection has been further divided into participants, procedures and tools used. Tools have been further subdivided to explain in detail the measures used to collect the data and their validation and reliability checking.

4.1 Research design

The present research is based on a cross-sectional survey conducted and is designed to be a descriptive as well as exploratory one. As, on the one hand, it defines the collected data facts, on the other hand, to some extent, it also is expecting to find something new.

4.2 Population and sample

Statistics related to the number of registered hotels in Himachal Pradesh are 3350 (HPTDC 2017) and approximately 902 (Santek Consultants Private Limited 2017) for J&K which constitutes the population of the study. The study targeted the hotels of Himachal Pradesh and J&K. Quota sampling technique was used to select the units for study. All together 120 hotels of Himachal Pradesh and J&K were used as a study sample to represent the population. Out of 12 districts, 5 districts of Himachal Pradesh were selected as quota on the basis of HPSDM report (Table 1) and 5 districts out of 22 from J&K on the basis of NIDM report (Table 2) and respondents were selected as per convenience from each quota to come up with the representative sample of 120 for the entire population.

The 10 districts were chosen based on the number and intensity of threats. For Himachal Pradesh, the number of threats which were very high (VH) and high (H) were counted. If VH and H were in total equal to or more than four (out of 7), the districts were considered. For J&K, 5 districts were selected based on their presence in at least three of the rows (hazards) of Table 2. The 10 districts for study are Chamba, Mandi, Kullu, Shimla and Kinnaur from Himachal Pradesh and Anantnag, Kishtwar, Srinagar, Doda and Ramban from J&K.

Table 1 District-wise threats in Himachal Pradesh. *Source*: HPSDM report, 2012

District	Earthquake	Landslide	Floods	Avalanche	Forest Fire	Drought	Cloud Burst
Kangra	VH	L	M	M	H	H	M
Chamba	VH	VH	H	M	H	M	H
Hamirpur	H	L	L	–	VH	M	L
Mandi	VH	H	H	–	VH	M	H
Kullu	VH	VH	H	H	H	M	VH
Bilaspur	H	M	L	–	VH	M	L
Una	H	L	H	–	M	H	L
Sirmour	H	L	L	–	VH	M	M
Solan	H	M	L	–	M	M	L
Kinnaur	H	H	H	VH	M	M	VH
Lahaul & Spiti	M	M	M	VH	M	M	H
Shimla	VH	H	H	M	H	M	H

Table 2 Hazard-wise classification of districts of J&K. *Source*: NIDM report, 2014

S. No.	Hazards	Districts Covered
1	Earthquakes	Most parts of the Kashmir Valley (11% of the area of the state) covering the Districts of **Srinagar**, Ganderbal, Baramulla, Kupwara, Bandipora, Budgam, **Anantnag**, Pulwama, **Doda**, **Ramban**, **Kishtwar** come under Seismic Zone V, where around 50% of the population of the State lives.
2	Floods	Low-lying areas of the Kashmir Valley, especially Sonawari, Awantipora, **Srinagar**, along with parts of Jammu are prone to floods.
3	Avalanches & Snow Blizzards	Higher reaches of Kashmir including **Anantnag**, Kulgam, Gurez, Kargil, Leh, **Doda**, **Ramban**, **Kishtwar**, Banihal, **Srinagar** face avalanches.
4	Landslides	Areas along major highways particularly **Ramban**, Panthial, Banihal, **Doda**, **Kishtwar**, Gulmarg, Dawar, Gurez, Tangdhar, Rajouri, **Anantnag** are landslide prone.

4.3 Data collection

The research made use of primary data, which was collected using structured questionnaire distributed to 205 hotels out of which 120 respondent hotels reverted. The process of data collection took five months from January 2017 to May 2017. Participants, procedures and tools have been discussed in this section.

4.3.1 Participants

Participants were primarily managers from major hotels and resorts, who were directly responsible for or most knowledgeable about their resort's environmental policies or overall operation. The respondents were categorized based on the nature of their position in hotels into three groups. These are managers ($N=72$), proprietors ($N=34$) and general managers ($N=14$). In many hotels, the task of managing the sustainability and environmental performance is an added responsibility assigned to some of the employees.

4.3.2 Procedures

Quota sampling method has been used for the present research. A non-probability method has been employed as it was not possible to visit any random hotel especially in the district of J&K and also due to unwillingness of the most of the hotels. Emails and phones were the mediums used to communicate with the participants. The questionnaire that was developed was circulated online to various hotels. In the survey, the respondents were provided with the complete knowledge about the reason and content of it and were assured of its anonymity and confidentiality. Besides online distribution, those who were approachable in-person were handed over the hardcopies, which were recollected later. Questionnaire contains inquiries into the practices concerning environmental sustainability innovations, diffusion of innovation theory indices and resort demographics.

4.3.3 Tools

An environmental sustainability innovation measure (Table 3) was created, and measures to test the DIT variables (Table 4) were used as such from the Rogers' theory. The majority of indices were based on a Likert-type scale. The present research has utilized previously tested survey instruments to minimize complications, thereby increasing the reliability of each item. The reliability estimates are mentioned in Table 3 for sustainability innovation indices and in Table 4 for DIT indices. Subject and industry experts were consulted before final data collection for content validating the survey instrument. After that, pilot testing was carried out by the researcher to identify any flaws on the questionnaire to reduce errors and test for consistency. These have been explained in the subsections that follow.

4.3.3.1 Environmental sustainability innovation measures (ESI measures) The environmental sustainability innovation measure combined eight subscales which includes sustainability management, food waste and purchase management, managing environmental communication and pollution, resource and energy conservation, transportation energy conservation, water recycling, waste water management and guestroom sustainability. To create reliable scales, reliability and factor analysis were conducted to construct these indices; the

Table 3 Environmental sustainability innovation measures

S. No.	Name	Variables
1.	Sustainability Management	Written environmental policy Creation of an environmental Committee Creation of a detailed program to reduce environmental impacts Creation of an environmental impact assessment report Sending officials to conferences related to sustainability Assessment of greenhouse gas emissions or carbon footprint Hiring of external consultants to advise on environmental policies or programs The adoption of any nationally or internationally recognized sustainability certification programs None of the above
2.	Food waste and Purchase management ($\alpha = 0.780$; $N = 13$)	Separate collection of hazardous waste Recovery of used cooking oil Recovery of food waste Composting of food waste Purchasing products that are designed to be reusable Knowledge of the existence of local recycling firms and their operations Paying attention to recyclable materials Purchasing energy-saving materials Purchasing less hazardous cleaning supplies Purchasing resort products and materials that aim to reduce environmental impacts Strategic transportation policies to reduce environmental impact Resort building constructed thus utilizing sustainable materials and methods, maximize building efficiency, etc. Policies for remoulding include sustainable features
3.	Managing Environmental communication & pollution ($\alpha = 0.858$; $N = 8$)	Environmental education of guests Knowledge of environmental pollution around the resort Maintenance of local habitat and biodiversity Intervention to prevent this pollution Community environmental support, involvement, or advocacy Routine meetings to discuss environmentally related issues Knowledge of ISO 14000 Environmental Management System or Other nationally/internationally recognized environmental management systems Environmental Training of Staff

Table 3 (continued)

S. No.	Name	Variables
4.	Resource use and energy conservation ($\alpha = 0.806$; $N = 5$)	Purchasing renewable energy from local firms and companies Encouraging recycling among guests Purchasing renewable energy credits/green tags Producing all of your resort's energy through solar, wind, or other renewable sources of energy Providing public transportation for guests
5.	Transportation energy conservation ($\alpha = 0.703$; $N = 3$)	Resort's transportation fleet utilizing alternatively fuelled or hybrid vehicles Purchasing renewable energy from a local utility provider Employee Carpool or alternative transportation incentives
6.	Water Recycling ($\alpha = 0.666$; $N = 3$)	Rainwater/snow runoff capture and reuse Discharge of treated waste water Use of recycled water for snowmaking
7.	Waste water management ($\alpha = 0.752$; $N = 4$)	Mention of environmental messages/statements at required places Cooperation with recycling firms On site waste water treatment Use of treated waste water
8.	Guestroom Sustainability	No Guest Rooms Energy saver control system in guest rooms Key-card control system in guest rooms that shuts off power when card is removed Using energy-saving light bulbs in guest rooms In-room recycling containers (e.g. for newspaper, plastic bottles, etc.) Voluntary linen/towel reuse program Sorting linen according to dirtiness Strategically reducing the amount of cleaning chemicals to use Using sensor activated lighting in lobby restrooms and other locations that only require intermittent lighting

Table 4 DIT Indices

S. No.	Name	Variables
1.	Relative Advantage ($\alpha = 0.757$; $N = 5$)	Will create significant cost-savings for the company Will reduce customer satisfaction (reverse coded) Will add significant value and market advantage to our resort's profile and services Will reduce employee satisfaction, retention, and productivity (reverse coded) Will protect us from future lawsuits and anticipate future regulations
2.	Compatibility ($\alpha = 0.913$; $N = 4$)	Doesn't match to our current procedures. (reverse coded) Will not interfere with the products and services we purchase from our suppliers Would be compatible with our current facilities Are incompatible with our existing employee practices (reverse coded)
3.	Innovativeness ($\alpha = 0.615$; $N = 2$)	Our hotel/resort often embraces new ideas Our hotel/resort will often adopt new practices and products before other resorts in our industry
4.	Simplicity ($\alpha = .820$; $N = 4$)	Requires too much technical expertise (reverse coded) Will be easily attainable due to our expansive knowledge about environmental sustainability Will require minimal resources Is much too complex to implement at this time. (reverse coded)
5.	Environmental opinion leadership ($\alpha = 0.885$; $N = 4$)	Dialogues with other resorts in our industry about environmental sustainability Is very likely to be consulted by other resorts in our industry about Sustainability innovations Learns a great deal more about environment sustainability from other resorts than they do from us Is considered by other resorts to be a reliable source of information on Environmental sustainability
6.	Trialability ($\alpha = 0.811$; $N = 3$)	Before deciding to adopt a sustainability innovation, our resort would need to test the adoption on a smaller scale Having time to try sustainability innovations would motivate our resort to adopt those innovations A trial period would have no influence on our resort's decision to adopt a sustainability innovation

selected indices items were adopted from previous relevant and cited literature (e.g. Honey 2008; Erdogan and Baris 2007; Bansal and Roth 2000; Enz and Siguaw 1999; Smerecnik and Anderson 2011; Trung and Kumar 2005; Wisdom et al. 2014; Kneipp et al. 2019). The titles of indices displayed in Table 3 were accommodated for an appropriate fit against the items they represent.

4.3.3.2 DIT indices The diffusion of innovation theory measure combined six subscales which includes relative advantage, simplicity, compatibility, trialability, innovativeness and opinion leadership. These indices were taken from previously cited literatures on DIT indices (Rogers 1995; Smerecnik and Andersen 2011; Wisdom et al. 2014). The items were further tested for reliability, and those that were significantly inter-correlated were only included in the scale. The missing item numbers in the table are those that were removed to improve the reliability of the scale:

5 Data analysis

Descriptive as well as inferential statistics has been used to analyse the data. The mean responses, standard deviation and other relevant statistics were computed to better understand the data. Relationships between responses were assessed and presented using tables and graphs. Questions for sustainability innovation index were factor analysed. Regression and correlation analysis was applied in this study to reveal relationships among variables in the findings from the data.

Hypotheses 1 to 6 have been tested for the univariate relationship with the help of correlation analysis between innovation and adopter characteristics and the various dimensions of ESI (Tables 5, 6). Multiple regression analysis has been used to test hypothesis 7 for combined effect with innovation characteristics as independent and the sustainability innovation index as the dependent variable (Tables 7, 8, 9, 10, 11, 12).

Table 5 Correlations among combined sustainability innovation (SI) measures and combined (DIT index) and individual DIT variables

DIT Index correlation Sig.	Combined SI measures
Relative advantage correlation	.458
Sig.	.000
Compatibility correlation	.314
Sig.	.015
Innovativeness correlation	.014
Sig.	.918
Simplicity correlation	.175
Sig.	.180
Env Opinion Leadership correlation	.217
Sig.	.007
Trialability correlation	.653
Sig.	.000

Table 6 Correlations among individual sustainability innovation (SI) measures (as defined in Table 3) and individual DIT variables

SI DIT Var	SM	FW& PM	ME& CP	RU& EC	TEC	WR	WWM	GS
Rl. Ad. correlation	.160	.504	.038	.434	.153	.333	.043	.235
Sig.	.223	.000	.774	.001	.242	.009	.744	.070
Compatibility correlation	.032	.211	.284	.125	.045	.256	.001	.218
Sig.	.809	.105	.028	.340	.734	.048	.994	.095
Innovativeness correlation	.160	.094	.230	.375	.213	.007	.023	.294
Sig.	.222	.477	.077	.003	.103	.958	.863	.022
Simplicity correlation	.019	.141	.137	.374	.097	.010	.140	.191
Sig.	.883	.281	.298	.003	.462	.937	.286	.144
Env. Op. L'ship correlation	.116	.565	.431	.735	.036	.105	.402	.025
Sig.	.377	.000	.001	.000	.785	.425	.001	.851
Trialability correlation	.016	.507	.153	.640	.076	.280	.073	.085
Sig.	.905	.000	.245	.000	.562	.030	.581	.519

Table 7 Model summary of combined variables

Model	*R*	*R* square	Adjusted *R* square	Std. error of the estimate	Change statistics		
					R square change	*F* change	df1
1	.458	.210	.196	14.35041	.210	15.394	1

Table 8 ANOVA of combined variables

Model	Sum of squares	df	Mean square	*F*	Sig.
1 Regression	3170.204	1	3170.204	15.394	.000
Residual	11,944.196	58	205.934		
Total	15,114.400	59			

Table 9 Coefficients of combined variables

Model	Unstandardized coefficients		Standardized coefficients	*t*	Sig.	Collinearity statistics		
	B	Std. Error	Beta			Tolerance	VIF	Beta
1 (Constant)	− .206	17.584	.458	− .012	.991	1.000	1.000	
DIT Index	.924	.235		3.924	.000			

Table 10 Model summary of individual variables

Model	*R*	*R* square	Adjusted *R* square	Std. error of the estimate	Change statistics		
					R square change	*F* change	df1
1	.689[a]	.474	.415	12.24541	.474	7.966	6

[a]Predictor: Combined DIT Indices

Table 11 ANOVA of individual variables

Model	Sum of squares	df	Mean square	*F*	Sig.
1 Regression	7167.048	6	1194.508	7.966	.000[a]
Residual	7947.352	53	149.950		
Total	15,114.400	59			

[a]Significance level of 0.05

Table 12 Coefficients of individual variables[a]

Model	Unstandardized coefficients		Standardized coefficients	*t*	Sig.
	B	Std. error	Beta		
(Constant)	21.671	18.600		1.165	.249
Relative Advantage	1.027	.776	.168	1.323	.192
Compatibility	.953	.860	.144	1.108	.273
Innovativeness	.361	1.690	.022	.214	.832
Simplicity	− .420	.692	− .077	− .607	.547
Opinion leadership	2.853	.556	.710	5.131	.000
Trialability	− 1.382	1.172	− .166	− 1.179	.244

[a]Dependent variable: SII (sustainability innovation indices)

6 Results and discussion

6.1 Results

The first aim was to study whether sustainability innovations are used in hotels of Himachal Pradesh and J&K. It has been found that out of the sample size of 120, 73.5% hotels are using sustainability innovations. Written environmental policy is considered the best predictor of the hotel's adoption of sustainability innovation.

The second aim was to study the sustainability innovations factors that are being adopted by the hotels and what all characteristics that are being discussed influence its rate of adoption.

6.1.1 Correlations

Table 5, reports all the correlations between individual DIT variables and combined sustainability innovations measures, while Table 6 reports correlations among individual

sustainability innovation (SI) measures and individual DIT variables. The significance levels of the correlations are also reported in the tables.

Hypothesis 1 Which postulates that "the relative advantage of environmental sustainability innovations is positively correlated with the adoption of environmental sustainability innovations", was established ($r=0.314$, $p<0.05$). Though after going through further analysis, it was found that RA index is only partially associated. Out of the six indices, only three were found to be correlated, viz. food waste and purchase management ($r=0.504$, $p<0.05$), resource use and energy conservation ($r=0.434$, $p<0.05$) and water recycling ($r=0.333$, $p<0.05$).

Hypothesis 2 Which postulates that "the adoption of environmental sustainability innovations is positively correlated with the degree to which they are compatible with current resort operations, practices, values and facilities", was not confirmed. However, the compatibility index correlated with two of the them, viz. managing environmental communication and pollution ($r=0.284$, $p<0.05$) and Water recycling ($r=.256$, $p<0.05$).

Hypothesis 3 Which suggests that "the perceived simplicity of environmental sustainability innovations is positively correlated with the adoption of environmental sustainability innovations", was not confirmed.

Hypothesis 4 Which postulates that "the degree to which a resort can try environmental sustainability innovations on a limited basis is positively correlated with the adoption of environmental sustainability innovations", was established ($r=.367$, $p<0.05$). However, the trialability index was partially confirmed with food waste and purchasing management ($r=.507$, $p<0.05$), resource use and energy conservation ($r=.640$, $p<0.05$) and water recycling ($r=.280$, $p<0.05$).

Hypothesis 5 Which postulates that "EOL is correlated with the adoption of environmental sustainability innovations", was established ($r=.653$, $r^2=0.42$ $p<0.05$). EOL correlated with Food waste & purchasing management ($r=.565$, $p<0.05$), Managing environmental communication & pollution ($r=.431$, $p<0.05$), resource use & energy conservation ($r=.735$, $p<0.05$) and waste water management ($r=.402$, $p<0.05$).

Hypothesis 6 Which claimed that "the perceived resort innovativeness is positively correlated with the adoption of environmental sustainability innovations", was not confirmed. However, it correlated with the guest room index ($r=.294$, $p<0.05$) and resource use & energy conservation ($r=0.375$, $p<0.01$).

Hypothesis 7 Which postulates that "the combined variables of the innovation and adopter characteristics will significantly predict the adoption of sustainability innovations", was confirmed ($r=0.458$, $p<0.05$). However, the combined variable of innovation (Sustainability innovation index) individually confirmed with relative advantage, opinion leadership and trialability.

Combined variable of sustainability innovation (sustainability innovation indices) is equal to the sum of sustainability management, food waste and purchase management (FW&PM), managing environmental communication & pollution (ME&CP), resource use and energy

conservation (RU&EC), transportation energy conservation (TEC), water recycling (WR), waste water management (WWM) and guestroom sustainability. Diffusion of innovation indices (DIT index) which predict the adoption is equal to the sum of relative advantage, compatibility, innovativeness, simplicity, environmental opinion leadership and trialability.

6.1.2 Regression

Hypothesis 7 Regression analysis of combined variables of innovation with combined variable of adoption

(a) Model Summary

Overall model fit is displayed in Table 7. It demonstrates the strength of the relationship between the model and the dependent variable.

The correlation coefficient '*R*' (linear correlation between the observed and predicted values of the dependent variable) and coefficient of determination 'r^2' (variability in the outcome accounted for by the predictors) have been reported in the table. The values are 0.458 (moderate relationship) and 21%, respectively. Adjusted *R*-square adjusted the statistic based on the number of independent variables in the model and hence compensates for model complexity. In this case, there was only one independent variable; hence, this value is of not much significance.

(b) ANOVA Table

Table 8 shows analysis of variance ANOVA that tests whether the model is significantly better at predicting the outcome than using the mean as a 'best guess'. The *F*-ratio represents the ratio of the improvement in the prediction that results from fitting the model (labelled 'regression' in the table), relative to the inaccuracy that still exists in the model (labelled 'residual' in table) (Field 2009). In this model, the value of *F* is 15.394 which is significant.

(c) Model Parameters

The main regression model containing coefficient is displayed in Table 9.

In multiple regression, the model takes the form of an equation that contains a coefficient (*B*) for each predictor. The B value tells us about the relationship between sustainability innovation index and DIT index (Field 2009).

The equation comes out to be:

$$\text{SII} = -0.206 + 0.924\ \text{DITI}$$

The equation conveys that with every unit increase in the DITI variable, there will be a 0.924 increase in the sustainability adoption rate of the hotel. For a managers' viewpoint, the more the focus is on adoption or diffusion of the sustainability innovations in their hotels, the more sustainable unit they will become. It has been reiterated in the past many a times that adoption of such practices leads to cost saving, profitability, employee's satisfaction and morale, business image benefits, product/service market innovation, effective risk management, new source of revenue & cash flow and enhanced stakeholder relation (Bohdanowicz et al. 2011; Berns et al. 2009).

6.1.3 Regression analysis of combined variables of innovation with individual variables of DIT Index

(a) Model Summary

It is represented in Table 10. In the present case, the value of R is 0.689 indicating a strong relationship between the predictors and outcome. R square, the coefficient of determination, is the squared value of the multiple correlation coefficient which comes out to be equal to 47.4%. Adjusted R-square comes out to be 41.5%.

(b) ANOVA Table

Table 11 displays ANOVA, which shows the value of $F = 7.966$ and is significant.

(c) Model Parameters

Table 12 represents the coefficients. It shows that opinion leadership is the only as well as the strongest predictor of sustainability innovation index in the present scenario.

6.2 Discussions

The section discusses the contribution of the findings w.r.t significant and insignificant relationships.

6.2.1 Significant relationships

6.2.1.1 Environmental opinion leadership (EOP) EOP has been found to be most significant as it is the most strongly correlated characteristic with the adoption of ESI and also came out to be the only adopter characteristic to have the prediction capability about adoption of sustainability practices. This suggests that adoption of such innovations can be improved significantly if environmental opinion leaders advocate the adoption of sustainability innovations. Also, it can be seen from Table 5 that it also correlates significantly with almost all of the other sustainability innovation measures, hence making it the most important factor for better adoption of sustainable practices. Thus, the findings suggest that for sustainability to be more prevalent in the present scenario, opinion leaders will the one to play the major role in spreading the word of mouth in favour of sustainability innovations in the Indian context. This finding can further be supported by the fact that when there is a change occurring in the society, opinion leaders are the first to adopt it (Rogers 2003).

6.2.1.2 Relative advantage Perception about RA was found to be significantly related to the sustainability innovation indices, but with further analysis, it was found that it partially confirms with it as only three of the individual indices which included food waste and purchase management, resource use and energy conservation, water recycling were found to be significantly related to it. It is well known that businesses always look forward for innovations that may provide them with competitive advantage. Sustainability still being an emerging trend, signals the possibility that many hotels are still in early stage of adopting these innovations and

thus are less financially inclined towards the adoption of such practices and more towards other well-established strategic moves. Another reason could be the varying position of participants and their knowledge of sustainability. It is possible that decisions related to adopting sustainability are made by proprietor or company board and the participants were lesser aware of its advantages.

6.2.1.3 Trialability Trialability was found to be significantly correlated to sustainability practices but only partially as it was confirmed with further analysis. It is positively correlated with food waste & purchase management, resource use & energy conservation and water recycling and this may be because suppliers of these may offer trial periods. Also, such facility gives a full view of the innovation before investing into it and makes the stakeholders more confident about the decision.

6.2.2 Insignificant relationships

6.2.2.1 Simplicity compatibility & innovativeness Simplicity was not found to be significantly correlated to overall sustainability innovation indices. Also, when partial relationships of simplicity with factors of SII were verified, it was found that it significantly correlates only with resource use and energy conservation. Though earlier in one of the researches, it was found that simplicity is the most predictive variable out of these six (Smerecnik and Anderson 2011). According to Shrivastava, 1995, companies considering adoption of such practices find perceived complexity to be a barrier. Also, Rogers 2003 defined complexity as one of the variables affecting innovation adoption. It may be a possibility that the participants probably were not able to identify with simplicity as they might have with complexity. Thus, it is suggested to use complexity as a variable for future research especially in the present country.

In the present study, though innovativeness does not correlate significantly with adoption of sustainability practices, it does correlate positively with one of its factors, i.e. resource use & energy conservation which shows that changes in hotels by bringing innovation may pull others too, to adopt these sustainability practices. It has been found earlier that adoption of innovation leads to performance (Hult et al. 2004), yet there have been very few studies establishing relationship between these two (Smerecnik and Andersen's 2011).

Compatibility too just like simplicity and innovativeness was not found correlated to sustainability innovation adoption. Though it was found to be positively correlated with two of its dimensions, viz. managing environmental communication & pollution and water recycling. It is not a surprise that compatibility correlates with communication. This suggests that for sustainability innovations to be more frequently adopted by the hotels its compatibility with the current values, cultures and practices of the organization requires proper communication and promotion.

7 Conclusions

This study reveals the importance of innovation diffusion in the process of adopting sustainability innovations, supporting studies investigating the diffusion and adoption of environmentally sustainable innovations applied DIT (Smerecnik and Andersen's, 2011; Chou et al. 2012). It has been found that EOL positively influences adoption of sustainability innovations in the present scenario. Thus, making the communication of such practices through word of mouth (opinion leaders) is a very effective method of increasing

the adoption rate of such practices. These findings may prove useful to suppliers, change agents, etc., in the hotel industry by updating them on the process and factors of diffusion in this industry. This can be used as a key motivator to promote sustainability innovations. This study provides a valuable contribution to the emerging fields of hotel sustainability and diffusion of sustainability innovations. Such innovations can dramatically transform and reshape the way these organizations serve their customers and hence contribute to developing a society that is more conscious towards sustainable lifestyle (Denning 2005).

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