Examining factors influencing sustainable technology adoption among apparel manufacturers with supportive HR practices

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ABSTRACT – REZUMAT

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This study examines the influence of supportive HR practices, knowledge of apparel technology, environmental issues, competitor pressure, customer pressure, and regulatory pressure on employee intention to adopt sustainable technology in apparel manufacturing. It also explores the moderating role of government support on the relationship between employee attitude and intention to adopt sustainable technology. Data were collected from employees in apparel manufacturing firms. Findings reveal that these factors explain 74.2% of the variance in employee attitude toward adopting sustainable technology. Additionally, government support and employee attitude account for 30.3% of the variance in employee intention to adopt such technology. Effect size f^2 analysis highlights supportive HR practices and knowledge of apparel technology as the most significant predictors of employee attitude. Practically, the study emphasises the importance of knowledge, competitor pressure, and government support in fostering employee confidence and adoption of sustainable technology. The framework is original and schematizes these influencing factors.

Keywords: *environmental issues, regulator pressure, competitor pressure, customer pressure, sustainable technology*

Examinarea factorilor care influențează adoptarea tehnologiei durabile în rândul producătorilor de îmbrăcăminte cu practici de resurse umane favorabile

Acest studiu examinează influența practicilor de resurse umane favorabile, a cunoștințelor privind tehnologia din industria de îmbrăcăminte, a problemelor de mediu, a presiunii concurențiale, a presiunii clienților și a presiunii normative asupra intenției angajaților de a adopta tehnologii durabile în producția de îmbrăcăminte. De asemenea, studiul explorează rolul moderator al sprijinului guvernamental asupra relației dintre atitudinea angajaților și intenția acestora de a adopta tehnologii durabile. Datele au fost colectate de la angajații unor firme din industria de îmbrăcăminte. Rezultatele arată că acești factori explică 74,2% din variația atitudinii angajaților față de adoptarea tehnologiilor durabile. În plus, sprijinul guvernamental și atitudinea angajaților reprezintă 30,3% din variația intenției angajaților de a adopta astfel de tehnologii. Analiza mărimii efectului f^2 evidențiază practicile de resurse umane favorabile și cunoștințele privind tehnologia confecțiilor ca fiind cei mai semnificativi predictori ai atitudinii angajaților. Din punct de vedere practic, studiul subliniază importanța cunoștințelor, a presiunii concurenței și a sprijinului guvernamental în consolidarea încrederii angajaților și în adoptarea tehnologiilor durabile. Cadrul conceptual este original și schematizează acești factori de influență.

Cuvinte-cheie: *probleme de mediu, presiunea autorităților de reglementare, presiunea concurenței, presiunea clienților, tehnologie durabilă*

INTRODUCTION

With the advent of the 4th industrial revolution organizations are using cutting-edge technology to bring innovation in the manufacturing process.

Nevertheless, less attention is paid to sustainable technology to promote green practices in the manufacturing process [1]. The apparel industry is considered the most polluted sector globally, producing vast amounts of waste and emitting hazardous gases [2]. Moreover, the clothing manufacturing process consumes excessive natural resources and generates waste disposal in the environment, causing air and water pollution [2, 3]. Due to rising concern about environmental pollution, the United Nations climate change body has introduced a framework, namely the Fashion Industry Charter for Climate Action (FICCA), with an objective to achieve zero emissions by 2025 [4]. Thus, apparel manufacturers are striving to find factors which conserve natural resources and reduce greenhouse gases. Nevertheless, sustainable technology is recognised as an emerging technology to reduce the carbon footprint in the clothing manufacturing process. Sustainable technology assists manufacturers in monitoring and controlling the manufacturing process through automation, resulting in efficient production with minimum waste [5]. Although sustainable technology reduces energy and material consumption and mitigates the carbon footprint in the manufacturing process, adoption of sustainable technologies among apparel manufacturers is still in its initial stages [6].

The apparel industry in Saudi Arabia is predicted to grow by 2.68% from the period of 2024 to 2028, with an attractive market volume of US$ 19.35 bn [7]. Nevertheless, there is less discussion on how clothing manufacturers could benefit through sustainable technology. Therefore, current research fills the research gap and develops a sustainable technology adoption model in the context of apparel manufacturing. The research model of this study comprises factors like supportive HR practices, knowledge of apparel technology, knowledge of environmental issues, competitor pressure, customer pressure and regulatory pressure and investigates industry willingness towards adoption of sustainable technology. The factors underpinning the research framework have a strong conceptual linkage with the adoption of sustainable technology. For instance, studies have revealed that supportive HR practices encourage employees to adopt sustainable technologies in manufacturing firms [8–10]. Similarly, prior studies have revealed that employees with adequate knowledge about apparel technology and environmental issues have shown more inclination toward adoption of sustainable technology in the apparel industry [1, 11, 12]. According to a previous study [12], deploying energy and material-saving technologies has created competitive pressure among apparel manufacturers. In addition to that, customer pressure and regulatory pressure have also pushed manufacturers to adopt sustainable and environmentally friendly technologies in apparel manufacturing [12, 13].

Consistent with the above arguments, this study has assumed that supportive HR practices, knowledge of apparel technology, knowledge of environmental issues, competitor pressure, customer pressure and regulatory pressure are key factors that could motivate employees to adopt sustainable technologies in the apparel manufacturing industry. More precisely, this study strives to investigate how supportive HR practices impact employee attitudes toward adopting sustainable technology in the apparel industry. How does knowledge about apparel technology and environmental issues impact employee attitude to adopt sustainable technology? Do competitor, customer and regulatory pressure impact employee attitudes toward adopting sustainable technology in the apparel industry? Aside from the above research objectives, this study adds a new dimension to the research framework and investigates the moderating effect of government support. This study seeks to investigate how government support moderates the relationship between employee attitudes and their behavioural intention to adopt sustainable technology. Although sustainable technology has been examined in the food industry and in marine renewable energy projects [14, 15], its impact in the apparel sector remains largely overlooked. Nevertheless, this study is unique as it develops a completely new sustainable model and directs employees that with sustainable technologies, they could reduce energy and material consumption, resulting in a positive contribution to the environment and society. The remainder of this research is followed by a literature review, questionnaire development, research methods, data analysis, discussion, research contributions to theory and practice, conclusion, research limitations and future research directions.

LITERATURE REVIEW

Supportive HR practices, knowledge and environment

The adoption of technology is a complex phenomenon, and therefore recruitment of technology-oriented personnel could play an important role in achieving organisational goals. Traditionally, the role of HR practices is to equip employees to deal with ongoing challenges through training and development programs. Nevertheless, supportive human resource practices ensure that employees and employers are both on the same page to achieve sustainable goals [16]. Therefore, and with the support of prior literature, it is assumed that supportive HR practices encourage employees to adopt sustainable technologies in the apparel manufacturing process [8–10, 17]. Aside from supportive HR practices, two other important factors, namely knowledge about apparel technology and environmental issues, have gained significant attention of academician and practitioners in sustainability literature. According to a previous study [11], manufacturing firms experiencing regulation regarding sustainability must have adequate knowledge about apparel technology.

Adequate knowledge about sustainable technology assists managers to understand the impact of technology in achieving the firm's sustainable goals. Literature has substantial support that employees with adequate knowledge of apparel technology have shown more inclination toward adoption of sustainable technology in the apparel industry [1, 11]. Similarly, knowledge about environmental issues enables employees to understand the adverse impact of apparel manufacturing on the environment. Prior studies have revealed that employees having knowledge about environmental issues tend to show more inclination towards adoption of sustainable technology [1, 12]. Nevertheless, a lack of knowledge about the impact of waste on environmental issues could reveal undesirable and disastrous outcomes [18]. Therefore, employees with higher knowledge of environmental issues will prefer to adopt sustainable technologies in the apparel manufacturing process [12, 18]. Therefore, the following hypotheses are assumed:

H1: Supportive HR practices are positively related to employee attitude toward adopting sustainable technology.

H2: Knowledge about apparel technology is positively related to employee attitude toward adopting sustainable technology.

H3: Knowledge about environmental issues is positively related to employee attitude toward adopting sustainable technology.

Competitor, customer and regulatory pressure

The proliferation of technology has led organisations to adopt the latest technology software to bring innovation in the manufacturing process. Among these technologies, sustainable technology has gained significant attention due to echo friendly nature. In addition to that, the Fashion Industry Charter for Climate Action (FICCA) has also encouraged manufacturers to adopt sustainable technology in the apparel manufacturing process. Sustainable technology improves the manufacturing process and ensures business continuity. Moreover, Hoque et al. [12] revealed that deploying energy- and material-saving technologies in the apparel manufacturing process provides a competitive edge to apparel manufacturers.

Sustainable technologies bring innovation and empower manufacturers to remain competitive in a volatile market. In line with the above argument, authors like Baah et al. [19] have stated that adoption of sustainable technology enhances competitive advantage by reducing energy and material consumption in the manufacturing process. Therefore, competitor pressure is considered a unique driving force that motivates manufacturers to adopt sustainable technology in the manufacturing process. Moreover, the literature has also revealed that customer and regulatory pressures are key antecedents of technology adoption. It is established that manufacturers' sustainable practices are largely dependent on customer expectations of how they respond to eco-friendly products. Studies have revealed that customers have refused to buy company products that degrade or are harmful to the environment [20, 21]. Therefore, customer pressure is considered a key factor that pushes manufacturers to adopt sustainable and environmentally friendly technologies in the apparel manufacturing process [12, 13]. Similarly, the importance of regulatory bodies cannot be ignored in the corporate world. Prior literature has revealed that manufacturing firms are facing local and global regulatory pressure to use sustainable technologies in building green products [22–24]. Therefore, regulatory pressure is considered another force that encourages employees to use sustainable and environmentally friendly technology. Thus, the following hypotheses are assumed:

H4: Competitor pressure is positively related to employee attitude toward adopting sustainable technology.

H5: Customer pressure is positively related to employee attitude toward adopting sustainable technology.

H6: Regulatory pressure is positively related to employee attitude toward adopting sustainable technology.

The moderating effect of government support

The adoption of sustainable technology could be increased through government support. According to a previous study [11], a green manufacturing process is not possible without government support. The role of government is not only to push manufacturers towards adoption of green technology but also to provide support through incentives and subsidies for green technology. There is mutual consensus among researchers that adoption of sustainable technology in the manufacturing process brings efficiency and boosts green production [11, 25–27]. Prior studies have revealed that government bodies could exert pressure on manufacturers to train employees, provide technical support and adequate infrastructure, which in turn encourages employees to adopt sustainable technology in apparel manufacturing [25–27]. Moreover, adoption of sustainable technology will assist apparel manufacturers to achieve United Nations sustainable goals, such as the Fashion Industry Charter for climate action. Nevertheless, without stakeholders like the government, this target could not be achieved. Thus, government support is considered a key determinant of employee attitude and intention to adopt sustainable technology [26]. Therefore, it is inferred that government support moderates the relationship between employee attitude and intention to adopt sustainable technology in the manufacturing process. Studies have also established that with the deployment of energy-saving technologies, apparel manufacturers could reduce the impact of CO_2 emissions [28, 29]. Therefore, the following hypotheses are assumed:

H7: Employee attitude is positively related to behavioural intention to adopt sustainable technology.

H8: Government support positively moderates the relationship between employee attitude and behavioural intention to adopt sustainable technology.

RESEARCH METHODS

Scale development

The research framework has outlined multiple latent factors that were measured with scale items. In quantitative kind of research, the literature has suggested either adopting or developing a completely new scale. Nevertheless, in this study, a scale exists, and therefore scale items are adopted. Supportive human resource practices are measured with scale items established by some researchers [16, 17, 30, 31]. Scale items for the latent factor knowledge about apparel technology were adapted from previous studies [2, 32]. Scale items for knowledge about environmental issues were adapted from Dickson [32] and Xie et al. [33]. Similarly, competitor pressure scale items were adapted from research work conducted by Shahadat et al. [27]. Scale items for the factor customer pressure were adapted from Lin and Ho [30]. Likewise, scale items for regulatory pressure were adapted from research work conducted by Ullah et al. [34]. Scale items for the factors attitude and intention to adopt sustainable technology were adapted from previous studies [16, 27, 35, 36]. Therefore, government support factors are measured with scale items adapted from Shahadat et al. [27] and Lin and Ho

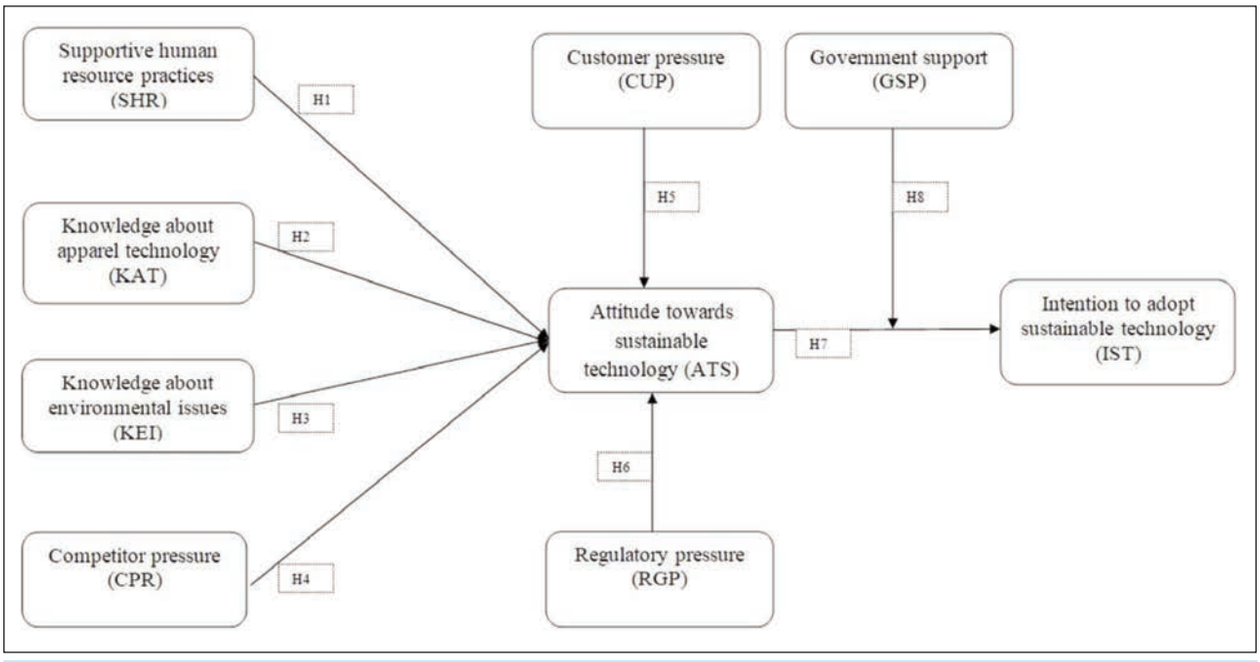

Fig. 1. Research model

[30]. These scale items were emerged into survey questionnaire. The survey questionnaire was evaluated by an expert panel that included three experts from academia and four senior managers from apparel manufacturers. Following the experts' opinion, contextual changes were made in scale items wherein the "technology adoption" phrase was changed to "sustainable technology adoption" to ensure clarity in scale items. Finally, these refined scale items were measured with a seven-point Likert scale ranging from 1 (Strongly disagree) to 7 (Strongly agree).

Sample size and data collection

The population of this study is employees working in apparel manufacturing firms. Consistent with research objectives, employees working in apparel manufacturing firms are considered the most relevant individuals to answer questions about sustainable technology adoption. Nonetheless, the sample size is selected following the criterion suggested by Rahi [37]. Rahi has postulated that for factor analysis, data must be ten times greater than scale items. Following that, in this study, 320 (32×10) responses are required for factor analysis. The data collection process was started in the first week of July 2024 and ended in the second week of August 2024. Respondents were approached physically and requested to fill out the survey questionnaire. Moreover, respondents were also briefed about sustainable technology in apparel manufacturing. Employees' participation in this study was completely voluntary, with a guarantee that personal information would not be disclosed. Data were collected through a purposive sampling approach that is consistent with prior studies [38, 39]. This approach is also relevant as respondents were selected from apparel manufacturing firms purposively with an aim that they would have better knowledge about sustainable technology adoption in the apparel manufacturing process. Therefore, 389 questionnaires were distributed among employees working in apparel manufacturing firms. After questionnaire distribution, several reminders were given to respondents through phone calls and by email. Nevertheless, only 335 responses were recovered and used for empirical investigation.

STATISTICAL ANALYSIS AND RESULTS

Descriptive analysis and common method bias

This study has analysed respondents' profiles using descriptive analysis. Data in this study have comprised 230 valid responses. Among 230 responses, 33% were found to be aged between 21 and 30 years. Therefore, 98 respondents were found in the age bracket of 31 to 40 years. Nevertheless, the remaining 55 respondents had revealed their age between 41 and 50 years. Similarly, respondents were asked about their experience in the apparel industry. Results indicate that 36 respondents were working in the apparel industry for the last 5 years. Therefore, 138 respondents were attached to the apparel industry for the last 10 years. Nonetheless, 56 respondents were found with a maximum experience of 15 years and onward. These findings have ensured that all cadre employees from junior level to senior management have participated in the research survey. Respondent's gender was asked, and results revealed that among 230 respondents, 203 were male and the remaining 27 were female employees. After analysing respondents profile common method bias issue is addressed with procedural and statistical remedies [37, 40]. Although literature has suggested multiple statistical analyses to address common

method variance bias (CMVB), in this study, data are computed with Harman's single-factor analysis [16, 17]. According to Rahi [16] espouses that Harman's analysis has the potential to detect the CMVB issue and recommended threshold value, i.e. 40% of the first un-rotated factor. To compute Harman's test, data are analysed with SPSS software. Statistical results have revealed that the variance explained by the first un-rotated factor was only 13% and hence confirmed data validity. In the following section, factor analysis is conducted with a structural equation modelling approach.

Structural equation modelling

Structural equation modelling is considered the most reliable approach for multivariate analysis. Therefore, data are estimated with a structural equation modelling approach following a two-stage approach, namely measurement model assessment and structural model assessment. At the first step, factor reliability, discriminant validity and convergent validity are established. Therefore, hypotheses, effect size and coefficient of determination are examined in the second stage. At the first stage, factor loadings are achieved following the threshold value of 0.60 as recommended by Rahi [41]. Therefore, factor reliability is established following the threshold value of 0.70 in line with previous studies [41, 42]. Similarly, convergent validity is established with average variance extracted following the threshold value of AVE 0.50 as recommended by prior researchers [40, 41].

Findings of the measurement model are shown in table 1, depicting satisfactory convergent validity, indicator reliability and factor reliability.

After establishing factor reliability, discriminant validity of the factors is tested. At the first stage, discriminant

Table 1

MEASUREMENT MODEL ASSESSMENT				
Scale items	**Loadings**	**AVE**	**CR**	**α**
ATS1: Sustainable technology-enabled apparel manufacturing is useful.	0.848	0.798	0.922	0.874
ATS2: Sustainable technology-based manufacturing process is beneficial.	0.917			
ATS3: Sustainable technology-driven manufacturing is attractive.	0.913			
CPR1: Adoption of sustainable technology is strategically necessary to compete in the market.	0.791	0.640	0.877	0.813
CPR2: Adoption of sustainable technology assists in achieving competitive advantages.	0.788			
CPR3: I am afraid that we will lose customers due to lack of sustainable technology in the manufacturing process.	0.829			
CPR4: Adoption of sustainable technology will enable us to compete in market place.	0.793			
CUP1: Our customers are concerned about environmental changes.	0.954	0.756	0.902	0.869
CUP2: Our customers feel that environmental safety must be considered during manufacturing.	0.841			
CUP3: Our customers feel that apparel manufacturers must use sustainable technology for environmental safety.	0.805			
GSP1: Government is giving support to apparel manufacturers to adopt sustainable technology in the manufacturing process.	0.796	0.699	0.874	0.784
GSP2: Government is providing technical assistance to manufacturers to adopt sustainable technology.	0.822			
GSP3: Government is providing subsidies on green technology to encourage manufacturers to adopt sustainable technology.	0.887			
IST1: Adoption of sustainable technology reduces carbon emissions in the environment.	0.954	0.848	0.943	0.910
IST2: Adoption of sustainable technology increases speed and reliability in the manufacturing process.	0.898			
IST3: Adoption of sustainable technology reduces carbon emissions in the environment.	0.909			
KAT1: This firm has adequate knowledge about sustainable technology.	0.879	0.835	0.938	0.901
KAT2: This firm can compete in the market through sustainable technology.	0.938			
KAT3: This firm can make environmentally friendly products with sustainable technology.	0.924			
KEI1: Manufacturing process is designed to reduce environmental impacts.	0.822	0.825	0.950	0.928
KEI2: Manufacturing firms are reachable for environmental audits.	0.961			
KEI3: Apparel manufacturers are adopting cleaner production methods.	0.940			

Table 1 (continuation)

Scale items	Loadings	AVE	CR	α
KEI4: Stakeholders are involved in planning and executing environmental practices.	0.904			
RGP1: Apparel manufacturers are being strictly monitored by regulators.	0.852	0.636	0.875	0.810
RGP2: Apparel manufacturers are bound to follow environmental regulations.	0.757			
RGP3: Apparel manufacturers could face penalties over noncompliance with environmental regulators.	0.793			
RGP4: Production standards in manufacturing firms have been strictly imposed by regulators.	0.786			
SHR1: Employees get equal opportunities to learn and use sustainable technology.	0.919	0.730	0.914	0.876
SHR2: This firm offers flexible training programs to improve employee skills.	0.835			
SHR3: Employees get quick technical support to solve problems.	0.937			
SHR4: Employees are encouraged to share knowledge.	0.706			

validity is established with the Fornell and Larcker method, and then results were compared with HTMT ratios and cross-loading values. In the Fornell and Larcker analysis, the very first value of the factor in the correlation table is considered the square root of average variance extracted.

Therefore, a study such as Rahi [37] suggests that the square root of the average variance extracted should be greater than its correlations with other constructs. Similarly, Fornell [43] has recommended that for satisfactory discriminant validity, the square root of average variance extracted should be higher in comparison to other factor values. Data were estimated, and results have shown that the first value of each factor is found higher, demonstrating that factors are discriminant. Table 2 demonstrates the results of the discriminant analysis and hence establishes the discriminant validity of the factors.

To ensure discriminant validity of the factors, the Heterotrait-Monotrait Ratio (HTMT) analysis is taken into consideration. There is debate in statistical literature that HTMT analysis is the most reliable analysis to compute discriminant validity of the factors [37, 44, 45]. Consequently, data were also confirmed with HTMT analysis. According to Rahi [37], a threshold value of 0.90 has been suggested, indicating that the associated estimates should fall below this limit. Nevertheless, results have disclosed that HTMT values are lower than the threshold value and hence confirmed the discriminant validity of the factors. Results of the discriminant validity are shown in table 3.

The cross-loading analysis is piloted to assess discriminant validity. In cross-loading analysis, factor loadings are compared with other factors' loadings following a pattern that each factor must have higher loadings in comparison to other factors [37, 46]. Nonetheless, results have disclosed that loadings are satisfactory and each factor loading is greater than other factors' loadings in cross-loading comparison. Table 4 depicts results of the cross-loading analysis.

Hypotheses analysis

Hypotheses are tested with a structural model. Structural model assessment reveals path coefficient values, p-values, and t-statistics that are further evaluated with threshold values to accept or reject hypotheses. Nevertheless, these values were

Table 2

DISCRIMINANT VALIDITY									
Factors	**ATS**	**CPR**	**CUP**	**GSP**	**IST**	**KAT**	**KEI**	**RGP**	**SHR**
ATS	0.893								
CPR	0.490	0.800							
CUP	0.130	0.079	0.869						
GSP	0.048	–0.004	0.143	0.836					
IST	0.530	0.340	0.129	0.112	0.921				
KAT	0.630	0.313	0.132	0.045	0.312	0.914			
KEI	0.536	0.231	0.054	–0.050	0.288	0.214	0.908		
RGP	0.082	0.051	0.009	–0.003	0.089	0.001	0.056	0.798	
SHR	0.703	0.355	0.113	0.078	0.425	0.349	0.417	0.189	0.854

Table 3

HETEROTRAIT MONOTRAIT RATIO METHOD									
Factors	**ATS**	**CPR**	**CUP**	**GSP**	**IST**	**KAT**	**KEI**	**RGP**	**SHR**
ATS									
CPR	0.582								
CUP	0.124	0.085							
GSP	0.059	0.065	0.157						
IST	0.580	0.396	0.125	0.133					
KAT	0.703	0.363	0.160	0.073	0.343				
KEI	0.590	0.266	0.074	0.061	0.304	0.234			
RGP	0.095	0.089	0.082	0.102	0.107	0.065	0.077		
SHR	0.761	0.395	0.096	0.101	0.468	0.368	0.450	0.220	

Table 4

CROSS LOADINGS									
Coding	**ATS**	**CPR**	**CUP**	**GSP**	**IST**	**KAT**	**KEI**	**RGP**	**SHR**
ATS1	0.848	0.422	0.064	0.021	0.366	0.470	0.454	0.012	0.487
ATS2	0.917	0.441	0.132	0.063	0.564	0.560	0.541	0.116	0.722
ATS3	0.913	0.452	0.143	0.038	0.468	0.645	0.436	0.077	0.645
CPR1	0.386	0.791	0.077	0.020	0.362	0.219	0.224	0.006	0.232
CPR2	0.376	0.788	0.041	0.017	0.289	0.202	0.202	0.017	0.187
CPR3	0.395	0.829	0.071	–0.052	0.259	0.281	0.157	0.042	0.304
CPR4	0.411	0.793	0.062	0.004	0.184	0.294	0.158	0.093	0.402
CUP1	0.159	0.081	0.954	0.153	0.143	0.119	0.049	–0.010	0.141
CUP2	0.067	0.063	0.841	0.084	0.069	0.146	0.037	0.022	0.042
CUP3	0.039	0.046	0.805	0.106	0.090	0.074	0.065	0.056	0.048
GSP1	0.011	–0.022	0.171	0.796	0.089	–0.023	–0.067	0.013	0.030
GSP2	0.078	0.025	0.082	0.822	0.086	0.067	–0.031	0.035	0.080
GSP3	0.033	–0.012	0.106	0.887	0.104	0.066	–0.030	–0.047	0.083
IST1	0.470	0.325	0.127	0.095	0.954	0.297	0.219	0.066	0.384
IST2	0.540	0.318	0.134	0.085	0.898	0.286	0.367	0.097	0.437
IST3	0.444	0.291	0.091	0.132	0.909	0.278	0.190	0.081	0.343
KAT1	0.602	0.295	0.039	0.051	0.316	0.879	0.189	–0.050	0.341
KAT2	0.572	0.297	0.144	0.035	0.262	0.938	0.214	–0.002	0.309
KAT3	0.549	0.264	0.184	0.037	0.275	0.924	0.182	0.060	0.304
KEI1	0.476	0.221	0.002	–0.045	0.176	0.204	0.822	0.034	0.287
KEI2	0.526	0.232	0.074	–0.067	0.309	0.197	0.961	0.057	0.439
KEI3	0.507	0.201	0.081	–0.009	0.303	0.184	0.940	0.059	0.397
KEI4	0.426	0.180	0.032	–0.064	0.250	0.192	0.904	0.052	0.385
RGP1	0.076	0.027	0.050	0.071	0.104	–0.001	0.058	0.852	0.153
RGP2	0.049	0.075	0.069	0.057	0.127	0.037	0.084	0.757	0.109
RGP3	0.062	0.032	–0.015	–0.080	0.051	–0.034	0.058	0.793	0.172
RGP4	0.069	0.041	–0.065	–0.057	0.015	0.008	–0.010	0.786	0.161
SHR1	0.618	0.323	0.105	0.115	0.402	0.264	0.369	0.197	0.919
SHR2	0.716	0.408	0.122	0.024	0.350	0.434	0.366	0.118	0.835
SHR3	0.617	0.259	0.091	0.079	0.398	0.279	0.419	0.206	0.937
SHR4	0.362	0.160	0.047	0.052	0.291	0.143	0.236	0.122	0.706

Table 5

HYPOTHESES TESTING						
Hypothesis	**Path**	***B***	**STDEV**	**t-statistics**	**Significance**	**Decision**
H1	SHR → ATS	0.410	0.058	7.033	0.000	Accepted
H2	KAT → ATS	0.380	0.059	6.492	0.000	Accepted
H3	KEI → ATS	0.245	0.041	6.031	0.000	Accepted
H4	CPR → ATS	0.170	0.036	4.662	0.000	Accepted
H5	CUP → ATS	0.008	0.044	0.173	0.431	Rejected
H6	RGP → ATS	-0.018	0.036	0.501	0.308	Rejected
H7	ATS → IST	0.527	0.063	8.401	0.000	Accepted

retrieved through the bootstrapping method as recommended by prior researchers [41–47]. Results of the hypothesis analysis have revealed that supportive human resource practices are positively related to employee attitude to adopt sustainable technology in manufacturing firms, followed by $\beta = 0.410$, STDEV = 0.058, t-statistics = 7.033, $p < 0.000$, and hence endorsing H1. Knowledge about apparel technology is positively related to employee attitude to adopt sustainable technology, followed by $\beta = 0.380$, STDEV = 0.059, t-statistics = 6.492, $p < 0.000$ and hence accepting H2. Similarly, knowledge about environmental issues has shown a positive impact in measuring employee attitude to adopt sustainable technology, followed by $\beta = 0.245$, STDEV = 0.041, t-statistics = 6.031, $p < 0.000$ and hence supporting H3.

Results have shown that competitor pressure is positively related to employee attitude to adopt sustainable technology, followed by $\beta = 0.170$, STDEV = 0.036, t-statistics = 4.662, $p < 0.000$, and hence establishing H4. Nevertheless, customer pressure has shown an insignificant impact in determining employee attitude to adopt sustainable technology, followed by $\beta = 0.008$, STDEV = 0.044, t-statistics = 0.173, $p > 0.05$, and hence rejecting H5. Moreover, the relationship between regulatory pressure and employee attitude to adopt sustainable technology is found insignificant, followed by $\beta = –0.018$, STDEV = 0.036, t-statistics = 0.501, $p > 0.05$, and hence rejecting H6. Nevertheless, employee intention to adopt is measured with employee attitude. Results have revealed a significant influence of employee attitude towards employee intention to adopt sustainable technology, followed by $\beta = 0.527$, STDEV = 0.063, t-statistics = 8.401, $p < 0.000$, and hence establishing H7. Results of the hypotheses are shown in table 5.

Importance performance analysis

The hypothesis analysis has revealed that factors such as supportive human resource practices, knowledge about apparel technology, knowledge about environmental issues and competitor pressure have shown a positive association towards employee intention to adopt sustainable technology. Nevertheless, the collective view is yet to be examined through importance-performance index analysis. Following the guidelines provided by Rani [37], the outcome factor is selected before data computation. By selecting employee intention to adopt sustainable technology, data were estimated with importance-performance index analysis. Results have demonstrated that employee attitude is the most influential factor in measuring employee behavioural intention to adopt sustainable technology.

Nevertheless, in terms of factor importance, supportive human resource practices stand at the second stage in measuring employee behavioural intention to adopt sustainable technology. Therefore, knowledge about apparel technology is considered another important factor and stands at the third level in measuring employee behavioural intention to adopt sustainable technology. Similarly, knowledge about environmental issues has shown a medium level of importance in measuring employee behavioural intention to adopt sustainable technology. Moving further, factors like government support and has shown the least importance in measuring employee behavioural intention to adopt sustainable technology. However, customer pressure and regulatory pressure have shown no importance towards employee behavioural intention to adopt sustainable technology. Table 6 depicts IPMA values in terms of factor importance and performance.

Table 6

IPMA ANALYSIS		
Intention to adopt sustainable technology		
Factors	**Importance**	**Performance**
Employee attitude	0.527	61.466
Competitor pressure	0.089	71.445
Customer pressure	0.004	68.268
Government support	0.065	60.236
Knowledge of apparel technology	0.200	60.733
Knowledge of environmental issues	0.129	61.751
Regulatory pressure	–0.010	77.521
Supportive Human Resource practices	0.216	61.318

Effect size analysis f^2

The research model of this study has comprised factors such as supportive human resource practices, knowledge about apparel technology, knowledge about environmental issues, competitor pressure, customer pressure and regulatory pressure to investigate employee attitude towards adoption of sustainable technology. Nevertheless, the research model is considered complex due to multiple exogenous and endogenous factors. Furthermore, policymakers are struggling to find relevant factors so that they can achieve maximum goals with minimum resources. In this regard, effect size *f–squared* analysis is taken into consideration following threshold values of 0.02, 0.15 and 0.35 depicting small, medium and large effect size respectively. In addition to that, the factors' coefficient of determination is also computed to reveal the collective impact of exogenous factors in measuring endogenous factors. Results are given in table 7, comprising the coefficient of determination and effect size of factors.

Results indicate that altogether supportive human resource practices, knowledge about apparel technology, knowledge about environmental issues, competitor pressure, customer pressure and regulatory pressure have explained 74.2% variance in employee attitude towards adoption of sustainable technology. Therefore, government support and employee attitude have explained 30.3% variance in employee intention to adopt sustainable technology in apparel manufacturing. Next, this effect size analysis has disclosed that supportive HR practices and knowledge about apparel technology are the most influential factors in measuring employee attitude to adopt sustainable technology. Therefore, knowledge about environmental issues has shown a medium level of effect size in measuring employee attitude. Factors like competitor pressure have revealed a small effect. However, customer pressure and regulatory pressure have disclosed no effect and hence are considered insignificant factors.

Table 7

COEFFICIENT OF DETERMINATION R^2 AND EFFECT SIZE f^2

Factors	Results	Size
Coefficient of determination R^2		
Attitude towards adoption of sustainable technology	74.2%	Substantial
Intention to adopt sustainable technology	30.3%	Substantial
Intention to adopt sustainable technology f^2		
Attitude towards adoption of sustainable technology	0.397	Substantial
Government support	0.006	Small
Attitude towards adoption of sustainable technology f^2		
Competitor pressure	0.092	Small
Customer pressure	0.000	No-effect
Knowledge about apparel technology	0.462	Substantial
Knowledge about environmental issues	0.189	Medium
Regulatory pressure	0.001	No-effect
Supportive Human Resource Practices	0.448	Substantial

Moderating analysis

The moderating effect of government support is tested between employee attitude and intention to adopt sustainable technology. Following the product indicator approach as suggested by Rahi [47], data were bootstrapped. Results revealed that government support positively moderates the relationship between employee attitude and intention to adopt sustainable technology, as indicated by β = 0.127, STDEV = 0.069, t-statistics = 1.834 significance at 0.033, also presented in Appendix 1. Moreover, simple slope analysis is conducted to ensure how the moderating effect strengthens the relationship. Therefore, result demonstrates that government support for GSP at + ISD shows an increasing trend and stands at the highest level when compared with GSP at – ISD. Therefore, simple slope analysis has endorsed H8 and confirmed that an increase in government support will boost employee attitude and intention to adopt sustainable technology. Figure 2 depicts the strength of the moderating relationship with positive and negative gradients.

DISCUSSION

In the past few decades, studies have widely focused on the usefulness of information technology in the apparel manufacturing process [48, 49].

Nevertheless, limited research exists on sustainable technology adoption by apparel manufacturers. Therefore, the current study adds knowledge to this emerging research field by examining the role of sustainable technology in the apparel manufacturing process. The apparel sector is considered a key sector in Saudi Arabia and significantly contributes to the Saudi economy. Nevertheless, the apparel industry is a source of water and air pollution and is considered the most polluted sector worldwide. Therefore, the current study aims to investigate factors that influence employee intention to adopt sustainable technology in the apparel industry, which in turn reduces the carbon footprint in the clothing manufacturing process. After detail literature review, this study has schematized that factors such as supportive HR practices, knowledge of apparel technology, knowledge of environmental issues, competitor pressure, customer pressure and regulatory pressure are key antecedents of employee intention to adopt sustainable technology in the manufacturing process.

Therefore, a conceptual linkage is established between exogenous and endogenous factors to investigate how these factors encourage employees to adopt sustainable technology in the apparel manufacturing process. Empirical investigation has

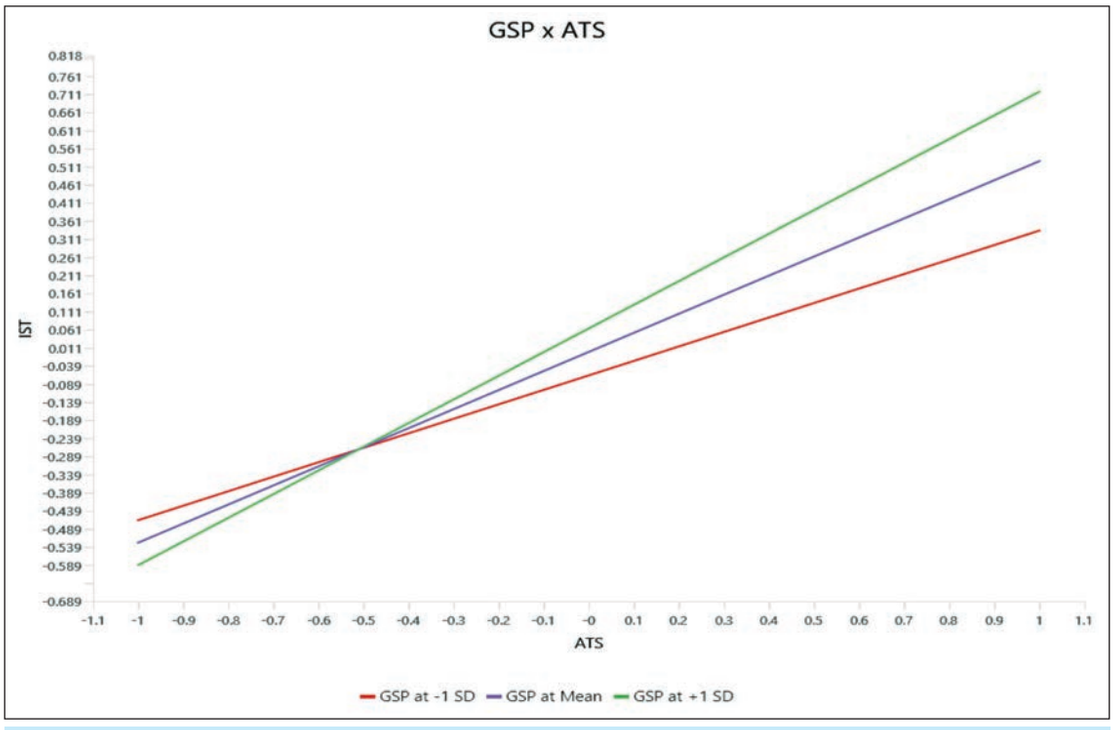

Fig. 2. Moderating trend with simple slope graph

revealed that supportive human resource practices are positively related to employee attitudes toward adopting sustainable technology in the manufacturing process and endorses arguments established by prior studies [8–10, 17]. Therefore, the first objective of this study is achieved with authentic findings that flexibility of human resource practices could encourage employees to adopt sustainable technology in the manufacturing process. The knowledge about apparel technology has also revealed a positive influence on employee attitude to adopt sustainable technology, in line with past studies [1, 11]. Likewise, knowledge about environmental issues has shown a positive impact in measuring employee attitude to adopt sustainable technology, consistent with past studies [1, 12]. These findings have established the second objective of this study with the recommendation that employees must know about apparel technology and environmental issues so that they put serious efforts in the deployment of sustainable technology in the apparel manufacturing process.

Empirical investigation has also disclosed that competitor pressure is positively related to employee attitude to adopt sustainable technology and is consistent with prior study [12]. Similarly, customer pressure and regulatory pressure were also conceptualised towards employee attitude to adopt sustainable technology in apparel manufacturing.

Nevertheless, contrary to the author's expectation bother customer pressure and regulatory pressure have shown insignificant impact in measuring employee attitude to adopt sustainable technology and hence reject arguments established by prior studies [22–24]. Therefore, the third objective of this study is achieved; following that, competitor pressure directly motivates employees and hence motivate to adopt sustainable technology in the manufacturing process. Nevertheless, employees are not concerned about regulatory pressure and customer pressure, and hence these factors have remained unsuccessful in creating an impact on employee attitude to adopt sustainable technology. Finally, the fourth objective of this study is achieved with empirical evidence that an increase in government support will boost employee attitude and employee intention to adopt sustainable technology in the apparel manufacturing process.

Theoretical contributions

The research framework of this study has schematized unique factors which influence employee attitude and intention to adopt sustainable technology in the apparel manufacturing process. For instance, this study has established that supportive human resource practices influence employee attitude to adopt sustainable technology and hence substantially contribute to the literature. Moreover, this study has summarised two core dimensions of knowledge, namely knowledge about apparel technology and knowledge about environmental issues and established the positive impact of these factors in determining employee attitude to adopt sustainable technology. Therefore, conceptualising these two unique dimensions of knowledge with relation to employee intention to adopt sustainable technology largely contributes to cognitive literature. Likewise, this study has also established that competitor pressure encourages employees to adopt sustainable technology in the apparel manufacturing process and hence enriches the literature. Nevertheless, this study has

rejected claims established by past studies that regulatory pressure and customer pressure are key indicators that influence employee attitudes toward adopting sustainable technology in the manufacturing process. Therefore, the current study invites researchers to review the literature in the apparel manufacturing setting and compare findings with current research and acknowledge differences. Another unique theoretical contribution of this study is to conceptualise and test the government support factor as a moderator between employee attitude and intention to adopt sustainable technology. The research framework has explained 74.2% variance in employee attitude towards adoption of sustainable technology and hence ensured theoretical validity of the sustainable technology adoption model.

Research contributions to practice

The newly developed research model provides multiple solutions to apparel manufacturers to reduce the carbon footprint in the clothing manufacturing process using sustainable technology. Primarily, this study has revealed that supportive human resource practices bring ease in training and development programs, which in turn provide opportunities for employees to learn the usage of sustainable technology and improve the manufacturing process. Therefore, policymakers could enhance sustainable technology adoption among employees through supportive human resource practices. Similarly, this study has revealed that employees keeping knowledge about apparel technology and knowledge about environmental issues would be in a better position to adopt sustainable technology. Therefore, policymakers should launch an awareness campaign to improve employee knowledge about environmental issues and knowledge about apparel technology, which in turn positively impacts employee attitudes toward adopting sustainable technology. In a dynamic business environment, policymakers have shown consistent struggle to find the most relevant factors so that they can achieve maximum goals with minimum resources. In this regard, this study has provided a micro and macro view of the factors through IPMA analysis and effect size analysis. Specifically, effect size analysis has disclosed a substantial effect of supportive human resource practices and knowledge about apparel technology in measuring employee attitude to adopt sustainable technology.
Therefore, policymakers could achieve maximum targets by focusing on supportive human resource practices and employee knowledge about apparel technology. Nevertheless, IPMA analysis has revealed a broader perspective and suggested that supportive human resource practices, knowledge about apparel technology, knowledge about environmental issues, competitor pressure and government support are key factors that boost employee confidence and encourage employees to adopt sustainable technology in the apparel manufacturing process.

CONCLUSION

The apparel manufacturing process is consuming excessive natural resources and releasing hazardous gases into the environment. Moreover, the apparel industry is considered the most polluted sector worldwide. To address this issue, the current study has developed a research framework that comprises factors such as supportive HR practices, knowledge of apparel technology, knowledge of environmental issues, competitor pressure, customer pressure and regulatory pressure, and investigates employee intention to adopt sustainable technology in the apparel manufacturing process. Similarly, this study has examined the moderating impact of government support on the relationship between employee attitude and intention to adopt sustainable technology. The research model is empirically tested with data retrieved from employees working in apparel manufacturing firms. Findings unveiled that jointly supportive human resource practices, knowledge about apparel technology, knowledge about environmental issues, competitor pressure, customer pressure and regulatory pressure explained 74.2% variance in employee attitude to adopt sustainable technology. Therefore, government support and employee attitude have explained 30.3% variance in employee intention to adopt sustainable technology in the apparel manufacturing process. Nevertheless, effect size analysis has demonstrated that supportive HR practices and knowledge about apparel technology are the most influential factors in measuring employee attitude to adopt sustainable technology. Moving further, IPMA analysis has revealed a broader perspective of the underpinning factors and suggested that supportive human resource practices, knowledge about apparel technology, knowledge about environmental issues, competitor pressure and government support are key factors that boost employee confidence and encourage employees to adopt sustainable technology in the apparel manufacturing process. This study has schematized unique factors which influence employee attitude and intention to adopt sustainable technology in the apparel manufacturing process and contributes to the literature. Practically, this study has suggested that policymakers could enhance sustainable technology adoption among employees through supportive human resource practices. Moreover, this study has suggested that knowledge about apparel technology, knowledge about environmental issues, competitor pressure and government support are some other key antecedents that encourage employees to adopt sustainable technology in the apparel manufacturing process. Nevertheless, this study has also revealed that government support strengthens the relationship between employee attitude and employee intention to adopt sustainable technology. Concerning significance, this study is the first to establish a conceptual linkage between supportive human resource practices and employee intention to adopt sustainable

technology. In addition, this study is vital as it focuses on the usage of sustainable technologies in the apparel manufacturing process, which in turn empowers a country to deal with societal and environmental challenges.

Limitations and future research directions

Despite several contributions, this study has some limitations and provides future research directions. For instance, the sustainable research model is developed and tested in Saudi Arabia, and therefore future researchers are suggested to conduct comparative research to reveal the differences.

Concerning the outlined factors, this study does not guarantee to include all factors that impact employee attitude toward adopting sustainable technology in the apparel manufacturing process. Therefore, the existing sustainable technology model could be extended with some other factors like awareness about apparel technology, green supplier and green innovativeness. The research model has direct and moderating hypotheses; however, mediating assumptions are lacking. Nevertheless, future researchers could add a mediating factor to enhance the strength of the research model. In this study, a single outcome factor is tested; however, future researchers are suggested to add other outcome factors in the research model, like sustainable purchase intention, environmental performance and organisational performance.

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