**Analysing the Impact of Sustainable Human Resource Management Practices and Industry 4.0 Technologies Adoption on Employability Skills**

**Purpose**: The study examines the influence of Sustainable Human Resource Management (SHRM) practices and Industry 4.0 Technologies (I4Te) adoption on the Employability Skills (ES) of the employees. The study has undertaken four major SHRM practices – Training (TR), Flexibility (FL), Employee Participation (EP), and Employee Empowerment (EE) and I4Te to measure its impact on employability skills.

**Research Methodology:** A survey approach method was designed on the constructs undertaken from existing literature based on SHRM, I4Te, and ES. The survey resulted in 198 valid responses. The study employed Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM) using SPSS 25.0 and AMOS 25.0 to confirm the construct and test the hypotheses.

**Findings:** The current study reveals that all the four SHRM practices (TR, FL, EP and EE) along with I4Te directly influence ES in the organisation. The I4Te , and SHRM practices may enhance skills and competencies that may help develop skilled manpower for future organisations.

**Social Implications:** For the development of the economy and the individual, the SHRM practices need to conduct themselves in more socially responsible ways along with the I4Te adoption to enhance the ES of the employees. The development brings sustainable behavioural changes in the employees.

**Practical Implications:** Considering the results, the SHRM practices aligned with I4Te may directly influence the employee’s ES, including core skills, IT skills, and personal attributes. The SHRM practices in the organisation will enhance the opportunities and long-term association for the employees.

**Originality:** There has been no research conducted on exploring SHRM, I4Te, and ES together. This is the pioneer in the HRM field that explores the inter-relationships and influence among the 5 constructs undertaken in the study.

***Keywords:*** Sustainable Human Resource Management (SHRM); Industry 4.0 Technologies (I4Te); Human Resource (HR) practices; Employability skills; Structural Equation Modelling (SEM).

1. **Introduction**

The world has witnessed the wave of a sociotechnical revolution under the umbrella term Industry 4.0 (I4.0), influencing the hard and soft resources of the organisations (Singh et al., 2021). The repercussions are highly visible on society, governance, and individuals. This new era is not limited to technological advancement and adoption only; it has heterogeneous implications on the policymakers and stakeholders (Sung, 2018; Fareri et al., 2020). It is projected that I4.0 will immensely influence people’s careers through dynamic changes in work, jobs, skills, and processes in the future. However, the transition towards intelligent smart systems makes the current jobs obsolete by 2025 (Duan et al., 2019). Due to the changing requirements, there is a concern in the organisations towards the shortage of Employability Skills (ES). Thus, organisations need to develop their human resources to make the best fit competitive for the long run and consequently affect performance outcomes (Guerci et al., 2019). The organisations can not overlook the critical issues faced by the economy, such as like climate change, global warming, pollution, waste generation etc. It demands an urgent need for the adoption of sustainable practices for a better and healthier future.

This is evident from the previous literature that Human Resources (HR) development is mainly responsible for the achievement of the organisational vision (Jewell et al., 20; Collins, 2020; Piwowar-Sulej et al., 2021). The organisations can also achieve sustainable development through strategic and operational management practices, including recruitment, selection, training and development, and creating a value system based on the triple bottom line business model (Adjei-Bamfo et al., 2019). For the individual and societal development, the Human Resource Management (HRM) of the organisations need to understand and transform their current practices and technologies to conduct themselves in more socially responsible ways (Cooke et al., 2020). In an organisation, the HRM act as a navigator to support the transformations and this new form of HRM practices is defined as Sustainable Human Resource Management (SHRM) that enables the organisations to achieve sustainability with an effective internal and external organisation environment over a long-term time horizon (Cugueró-Escofet et al., 2019; Almarzooqi et al., 2019; Karman, 2020). It is concerned with the use of HRM practices to develop human and social capital within the organisation.

The digital technologies have revolutionised the environment where each organisation competes with other to develop their competitive advantage (Savaneviciene and Stankeviciute, 2017). The innovation through Industry 4.0 Technologies (I4Te) has brought major transformation in the manufacturing sector but it is also true that this move has diminished the requirement of human resources. The efficiency and effectiveness in the decision-making have been enhanced drastically due to shared information through I4Te. In context to the I4.0 revolution, the concept of HRM 4.0 is a new area where the critical focus is on automation and strategic issues in place of repetitive actions (Stein and Scholz, 2020). HRM 4.0 aims to work on the fronts based on acquiring qualified talent, improvising organisational climate and firm’s strategic decision making (Almaaitah et al., 2020). The digital transformation has also enforced firms to adopt online tools, methods and services for optimising their decision-making. But still, the most crucial factor is to develop the adaptive mindset of the professionals towards the digital transformation (Singh et al., 2021). In recent years, technological innovations have altered the competency requirements of the organisation (Wikhamn, et al., 2019). The studies throw light not only on the presence of skill development but also the inevitable generation of new ones to cope with the digital transformation (Verhoef et al., 2021).

Employability skills (ES) include the soft skills that allow you to work well with others, apply knowledge to solve problems and fit into any work environment. The ES has become an emerging area due to the fierce competition in globalising markets influenced by innovation and technologies such as automation and virtual reality which demands both an individual and the firms to be agile and adaptive (Sima et al., 2020). Thus, the firms look for ways to develop sustainable career and human development that support longer working over the life cycle and continuously fulfil work requirements through optimal use of competencies (Schröder et al., 2020). The competencies refer to as “meta-competencies”, are significant for continuous learning and enable the HR professionals to stay employable (Mohamed et al., 2017). Employability is a key criterion for developing professionals, but to how much extent it is affected by SHRM practices and Industry 4.0 implementation is still unexplored. Until now, there have been few studies that examined SHRM practices. Thus, this study bridges this gap by exploring the effect of SHRM practices along with I4Te on the ES using Stakeholder theory and Institutional theory.

In recent years, SHRM has gained attention among research scholars (Morgeson et al., 2013). This attention has grown as the multiple stakeholders are interested in the organisational matters, including fair conduct, sustainable practices, employee empowerment etc. (Waldman and Siegel, 2008; Järlström et al., 2016; Järlström et al., 2018). SHRM is based on institutional theory and stakeholder theory. The institution theory indicates the synthesis paradox perspective of HRM where organisations achieve financial goals through high-performance working systems as well as make efforts to reduce harm imposed on employees (Mariappanadar and Kramar, 2014). The stakeholder theory enables organised thinking related to the responsibilities of employees and SHRM practices (Greenwood, 2007). The employees are the key stakeholders that have specific interests and need such as fair treatment, retention, care, wellbeing, empowerment etc., (Ulrich and Brockbank, 2005).

Thus, this research intends to assess the SHRM practices on the employability skills of the employees in the I4.0 era. Based on the above-mentioned research gaps, the present study establishes two Research Objectives –

* To examine the relationship between SHRM practices and the ES of the professionals in the firms; and
* To study the relationship between I4Te and the ES of the professionals in the firms.

The study contributes significant inputs in the area of SHRM practices and employee development. Firstly, the study will enrich the literature on SHRM practices and employability skills. This study would help develop sustainable practices and future strategies to enhance organisational and employee performance. Secondly, this study has proposed a unique hypothesized model based on stakeholder and institutional theories for measuring the effect of SHRM. The study has applied SEM using SPSS 25.0 and AMOS 25.0 as the most appropriate method for hypotheses testing.

The paper is organised into seven sections. Section 2 elaborates the concept and HR practices under the stream of SHRM. It also discusses the technological advancements in the organisations in the I4.0 era and the employability skills of the employees. Section 3 presents the hypotheses development followed by research methodology in section 4. Section 5 presents the analysis and results, followed by discussing the findings and implications of the study in Section 6. The paper ends with the conclusion, limitations, and future research directions in section 7.

1. **Literature Review**

From the published literature on SHRM, I4Te, and employability, the extraction of the relevant literature based on the systematic literature is conducted. The databases “Scopus” and “Web of Science” are searched with the multiple keywords “Sustainable Human Resource Management” AND “Sustainable Human Resource” AND “Human Resource Development” AND “Industry 4.0 Technologies” AND “Employability.” The extraction was carried step by step, as shown in Table 1. The research time limit has been undertaken from the year 2018-2020. The databases were searched during January 2021 using the criteria shown in Table 1.

**Table 1:** Search Criteria

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Search terms** | **Initial search** | **First filter** | **Second filter** | **Third filter** | **Fourth filter** |
| “Sustainable  Human Resource Management” AND  “Sustainable Human Resource” | 73 | 45 | 42 | 39 | 16 |
| “Sustainable human resource Practices” AND  “Employability” | 888 | 167 | 157 | 77 | 18 |
| “Human Resource Development” AND “Employability” | 1042 | 151 | 149 | 55 | 19 |
| “Industry 4.0 Technologies” AND  “Employability” | 60 | 36 | 21 | 25 | 10 |
| “Sustainable  Human Resource Management” OR “Employability” | 23 | 14 | 13 | 12 | 8 |
|  |  |  |  | **Total articles** | **71** |

The first results in 2086 articles. The first filter excludes the articles based on document types: such as thesis, reports, technical papers, editorial, and magazines, conference proceedings, and book chapters. A total was 413 papers were included for the second search. The second filter excluded the articles that were not in the English language that resulted in 382 articles. The third filter was used to exclude the articles based on duplicate publications title-wise. After the third refinement, a total of 188 articles were left. The fourth filter was to include the articles that were relevant to the study based on the abstract. Finally, a total of 71 articles were selected for the study.

* 1. ***Theoretical Foundation***

The research and practices in HRM have been criticised for concentrating on profitability at the cost of employees (Guest, 2011). Few studies have shown the improper treatment of the employees rather than considering them as assets for the organisation (Vanhala & Stavrou, 2013; Marchington, 2015).

The current study is based on stakeholder theory’s notion that an organisation’s success depends on the relationship with its stakeholders. This implies that successful organisations consider the relationship with the stakeholders that they affect and those that affect them (Freeman, 1994). The stakeholder theory elaborates the concept of organised thinking related to the organisational responsibilities and SHRM practices for sustainable development. The current study contributes to stakeholder theory by suggesting the extent of organisation with stakeholders that will enhance the sustainable practices of the organisation (Guerci and Shani, 2013; Sorribes et al., 2020). The stakeholders must play distinct roles and manage several functions related to SHRM (Guerci and Shani, 2013; Podgorodnichenko et al., 2020). The stakeholder’s interrelationship is the key element in developing SHRM practices in the organisation. The stakeholders include all the partners involved from the manufacturing process to the end-of-life process.

The institutional theory works within the resilient dimensions of a social system. The norms and policies are covered in this theory that is set up as authoritative directives for social actions. It covers the norms and policies set up as authoritative directives for social actions (Scott, 2004). The micro-foundations of institutional theory have been discussed by Powell and Colyvas (2008).

The institution theory indicates the synthesis paradox perspective of HRM where high-performance working systems are achieved through financial goals and a focus is on reducing the harm imposed on employees (Mariappanadar and Kramar, 2014).

Institutional theory has been used by previous researchers such as Kondra and Hinings (1998) for organizational diversity; Kostova et al. (2008) for multinational corporations and Zhu et al. (2013) in the field of green supply chain management; the previous researchers have used this theory for multiple assessments (Kondra and Hinings 1998; Kostova et al. 2008; Zhu et al. 2013; Singh Dubey et al. 2019). Bag et al. (2021) established that that institutional pressure compels firms to obtain resources and supports in the adoption of Big data analytics (BDA).

* 1. ***Sustainable Human Resource Management (SHRM)***

SHRM denotes the combination of the sustainability concept with the human resource. This concept is based on the approach promoting the HRM strategy that aims to develop a culture of mutual trust, cooperation, employee involvement, and loyalty towards the organisation (Cugueró-Escofet, 2019). The soft approach of HRM aspires to achieve financial goals but with a vision of developing a strong relationship between employer and employee. This soft strategy is very much effective in the retention of the employee in the long run and enhancing the involvement through knowledge sharing, commitment, generating ideas to achieve organisational goals (Manuti et al., 2020). SHRM includes the planned HR strategies and practices that intend towards sustainable goal achievement (Ehnert, 2009). It has become a key element for creating an organisation’s competitive advantage, developing employees’ skills and capabilities, knowledge enhancement through training, motivation, and rewards (Edvardsson, 2008). Therefore, the HR practices need to grow for possession of high skills, motivation, and opportunities to develop their competencies (Elnaga and Imran, 2013; Paré and Tremblay, 2007)

The organisations intend to develop sustainable ecosystems for enhancing the employee’s responsible behaviour to achieve organisational goals (Law et al., 2017). Thus, SHRM includes the practices that primarily include the extent to which a certain behavioural outcome to be emphasized. The focus is on the capacity for production and creating an HR system that enhances the social, economic, and environmental performances of the individual and the organisations (Manzoor et al., 2020). In other words, the HR system practices achieve goals based on the triple bottom line concept. The SHRM concept is gaining popularity in research due to its positive outcomes. The benefit of SHRM is not limited to organisations, it is beneficial for individuals, society, and the environment (Westerman et al., 2020). It is acting as a business strategy for the organisations. Thus, SHRM is a broader term and encompasses than just an environmental outcome. There are several HR practices related to SHRM, including participation, work roles, wellbeing, training, empowerment etc.

* 1. ***Industry 4.0 Technologies***

The organisations are redesigning their existing processes to upgrade their soft and hard skills (Babatunde, 2020). The managers are identifying innovative models to adopt the I4Te for improvisation in their processes. The managers have an additional responsibility of achieving sustainability goals (Kumar et al., 2020). Thus, the economic, environmental, and societal aspects are essential to be considered by the organisations while transitioning to the I4Te. Big Data Analytics (BDA), Artificial Intelligence (AI), Internet of Things (IoT), Robotics, Augmented Reality (AR) and Cloud Computing (CC) are adopted by the organisations to improvise their existing processes. All these technologies are considered under the umbrella of I4.0, known as the next generation of the industrial revolution, and emerged as the most promising solution to achieve sustainability. The major objective of the I4TEs is to enhance the responsiveness and the efficiency of the organisations (Ahuett-Garza and Kurfess 2018). These technologies integrate the horizontal and vertical streams and enhance the real-time flow of information among the partners. The IoT and CC are the core information technologies of I4TEs. The IoT employs a network of interconnected devices where each device has a unique identification, and communication takes place between the devices without human intervention. The BDA is needed by the organisations to develop integrated data-driven business models for enhancing the quality of data for analytics (Bag et al., 2020). The CC has the advantage of storing data on the Internet and helps in achieving economies of operation, fast services, and ease of accessibility. AM, AR, and robotics are required for simplifying and improvising the processes to achieve sustainability. AM is a useful technology for developing customised products in small batched with a high level of accuracy, whereas AR augments real-world objects. The other benefits of the I4TEs are quality control, remote assistance, safety, logistics, and training. AI-based manufacturing is an opportunity to promote digital products.

These technologies are used by organisations to enhance the quality of products, processes, and services. The HR of the organisations are exposed to different types of training and workshop that are organised for their skill up-gradation and enhances the knowledge related to sustainability outcomes. The I4Te has been implemented to educate HR of the organisations to adopt sustainable practices and to adapt to the advanced technologies systems for enhancing organizational performance.

* 1. ***Employability Skills***

There is no doubt in admitting that Employability Skills (ES) are essential for enhancing the skill set of an individual and to make them competitive. The paradigm of ES is changing in context to the future skill requirement of digital transformation. The concept of ES has been a century year old. During these years, there are several versions of employability. The first version of ES was given in the 1990s by Gazier. The term dichotomic employability was coined by him that made a line of difference between the individuals who can work and who can’t work. The other contributions in ES are (Brown et al., 2003; Fugate et al., 2004; Pool and Sewell, 2007; Bridgstock, 2009). The studies on employee perception have been discussed by (López-Fernández, 2018). The recent works in context to I4Te are clear and growing, but its impact on the SHRM is complex and needs to be measured as the function is relatively new. Skill forecasting and skill need analysis for industry 4.0 are the main issues and are managed by data analytics.

Nowadays, multifaceted problem-solving skills and critical thinking is highly demanded in addition to soft skills (creative thinking, empathetic behaviour and ability to motivate) (Lichtenthaler, 2018). These employability skills can be developed by the organisation efforts through proper training and development programs (Webster and Ivanov 2019). Acquisition of the people skills such as social networking, counselling, and collaboration will be highly demanded in the forthcoming years as technology is yet limited with the capability of emotional needs of the human beings (Kolbjørnsrud et al. 2016). Moreover, the employees are required to be highly adaptive towards modern workspace and technology to achieve sustainable outcomes with more efficiency and less cost.

Employee development is the need of today’s organisations (Lee and Bruvold, 2003). It needs the organisation to understand the importance of flexibility, wellbeing, participation, and competency (Heijde and Heijden, 2006). Also, employers, today cannot provide long-term guarantees for employment; they should provide more opportunities to enhance employability skills for their employees (Baruch, 2001; Van Buren, 2003).

It is very much clear that ES has been evolved from an ability to get initial employment to become competent. ES enhances skills and capabilities, enabling employees to manage their careers and future actions. The ES includes core skills, technical skills, and personal attributes in employees (Lowden et al., 2011).

1. **Hypotheses Development and Research Model** 
   1. ***Sustainable Human Resource Management and Employability Skills***

The SHRM practices include the HR practices for achieving organisational goals that are beyond financial performance. Sustainable practices will ensure a clean environment in the future, with healthy and satisfied employees. The SHRM practices not only entail the attraction and retention of motivated employees but also provide them with a healthy organisation culture to prosper in the future (Mariappanadar, 2020).

SHRM is base for theory building in HRM that focuses on the research and the practice. The SHRM practices, including employee empowerment, knowledge sharing, and performance outcomes, have been assessed in the previous studies and found the relationship significant (Stumpf et al., 2010; Moideenkutty et al., 2011; Almarzooqi et al., 2019).

The current study concentrates mainly on the 4 main HR practices: Training (TR), Employee Empowerment (EE), Employee Participation (EP), and Flexibility (FL) that may affect Employability Skills (ES) in the organisations. The stakeholder’s interrelationship is the key element in developing SHRM practices in the organisation. Based on stakeholder theory, SHRM practices need strong inter-relationship among the organisation’s stakeholders. The SHRM practices, including TR, EE, EP, and FL will be able to bring positive outcomes and accomplishing goals through stakeholder’s inter-relationships. The other perspective is based on the institutional theory as there is a need to focus on employee’s welfare and providing a workplace for knowledge enhancement and skill development.

* + 1. *Flexibility (FL)*

Previous studies have stressed the significance of FL in SHRM based on employee needs. The practices such as flexible working hours, remote working, work from home etc., are needed by the employees. The companies that offer more FL for work-life balance, results in a greater competitive advantage (Palm et al., 2020). Sustainable practices in FL results in long-term careers and healthier life as well (Patky and Pandey, 2020). The FL practices give more time to the employees for their skill development. Digital technologies have made remote accessibility easy and save lots of employee’s time and cost. These technologies are preparing the human for the future where more of machine interference will be taking place. The FL is measured with a pre-defined scale with 3 items. The proposed hypothesis is as follows:

*H1 (a): Flexibility (FL) has a significant impact on the employability skills (ES) of the employees.*

* + 1. *Training (TR)*

The changing environment is crucial for the organisation and the society to understand the detailed knowledge of skill set required in training programs that aims to enhance the sustainability practices and career opportunities to upskill and re-skill (Cedefop, 2019). The enhancement of skills through training implies the organisation’s assurance to the environment and societal problems (Teixeira, et al., 2016). TR can upgrade the employee’s capabilities to recognise the sustainability issues to understand its implementation in daily actions (Perron, Côté and Duffy, 2006). It can also improve decision-making competencies and stimulate the employees to adopt sustainable practices. Training programs on sustainability can contribute to shaping the new mindset and their perceptual development. It also fills the existing gap between the current skills of the employees and what is expected to gain in the future (Aragão and Jabbour, 2017). The TR is measured with 3 items. Thus, this study proposes a hypothesis to explore the interrelationship between the TR and ES.

*H1(b): Training (TR) has a significant effect on the Employability Skills (ES) of the employees.*

* + 1. *Employee Participation (EP)*

The employees of the organisation need support and a healthy environment to perform. The organisation needs to provide a participative environment to employees and inspire them to take new challenges. Employees are the resources or assets of the organisation. The organisation needs to develop a participatory environment that where supervisors and colleagues can work mutually. The previous literature shows that EP provides more opportunities to upgrade their skills and competencies. The EP is measured with 3 items. Thus, this study proposes a hypothesis to explore the interrelationship between the EP and ES.

*H1(c): Employee participation (EP) has a significant effect on the employability skills (ES) of the employees.*

* + 1. *Employee Empowerment (EE)*

Employee empowerment (EE) empowers to undertake many roles and responsibilities. The EE establishes the main roles such as competence, self-determination and impact and keeps the employees motivated to reciprocate the high performance (Paré and Tremblay, 2007). Further, EE stipulates positive organisational outcomes (Lashley, 2000; Chen et al., 2007) such as employee commitment, satisfaction, effectiveness, and productivity (Meyerson and Kline, 2008; Yao et al., 2013). ES acts as a psychological process (Hechanova et al., 2006) as it directly links the sustainable perception of organisational support. This is evident that effective employee empowerment brings sustainable HRM (Dewettinck and van Ameijde, 2011). The EE is measured using 3 items. This study proposes a hypothesis to explore the interrelationship between the EE and ES.

*H1 (d): Employee empowerment* (*EE) has a significant impact on the employability skills (ES) of the employees.*

* 1. ***Industry 4.0 Technologies and Employability***

The I4Te have significantly influenced the standard of living, income, flexibility, work from home, employee participation, training etc., As human capital is the most valuable asset for the organisation, they can derive competitive advantages from valorisation(Fulmer and Ployhart, 2013; Becker and Gerhart, 1996). HR needs to rethink its competencies and perception to adapt to the changes for developing the required skill set for employability and future needs. The organisations also need to reconsider the current innovative skill development and advance I4Te to be implemented in the business processes for enhancing performance. BDA has been utilised by organisations to explore new technological innovations around the world. The skill anticipation has been carried mainly for the macro level and very far from the company itself. Therefore, organisations struggle to reshape their skill inventory, job profiles, and structure.

Previous work of I4Te has shown the effect of these technologies on employees, especially the job profiles that need novel skills (Chryssolouris et al., 2013; Fareri et al., 2020). The changing environment affects the working conditions and competencies of individuals. Moreover, the concept of soft skills is the new essential for the workforce as these skills are resilient (Frey and Osborne, 2017). There is no question on the impact of the I4Te on the different aspects of work-life and employment skills.The I4.0 revolution is creating ample opportunities for organisations, but at the same time, it is raising fundamental questioned about the characteristic of the future human. Thus, this study proposes a hypothesis to explore the interrelationship between the I4Te and ES.

*H2: I4Te (IT) has a significant effect on the Employability Skills (ES) of the employees.*

1. **Research Methodology**
   1. ***Developing Instrument and Data Collection***

The current research work has employed a survey approach for collecting the data and evaluating the relationships among the constructs. The questionnaire was structured based on the research questions, and the responses were collected on a 5-point Likert scale. The constructs for SHRM, I4Te, and ES were taken from previous studies, including exogenous constructs; Flexibility (Järlström et al., 2018); Training (Pellegrini et al., 2018); Employee participation (Järlström et al., 2018); Employee empowerment (Dewettinck and van Ameijde, 2011); I4Te (Chryssolouris et al., 2013; Fareri et al., 2020). The endogenous construct (ES) is adapted from Fareri et al., 2020. The Flexibility (FL), Training (TR), Employee participation (EP), Employee empowerment (EE), and Employability Skills (ES) constructs are reflective.

The measurement scales have considered the implementation phase of I4Te and the adoption of SHRM practices. Through the measurement model, this study assesses the impact of the SHRM and I4Te on ES. The concept of SHRM and I4Te are still limited. Thus organisations are less aware of the benefits of these practices. The validation of the questionnaire was conducted in two phases. The first phase included the e-discussion with the experts from academia and corporates to check the relevance of the measure undertaken. For e-discussion, a panel of 9 experts was undertaken, including 2 senior professors in the area of HR, 3 professionals from the IT industry with experience of 5+ years, and 4 professionals from the area of Operations. The second phase included a pilot study conducted on 20 professionals working in HR firms. These professionals are well exposed to the I4Te and SHRM practices. The values of Cronbach’s alpha are computed and the items with low values are modified to enhance the clarity, ambiguity, and appropriateness. Table 2 elaborates the respondents’ demographic details for the survey conducted.

**Table 2:** Respondents demographic details (n=198)

|  |  |
| --- | --- |
| **Gender** | ***Percentage*** |
| *Male* | *56%* |
| *Female* | *44%* |
| **Age** |  |
| *> 30 years* | *11.62%* |
| *30-35 years* | *47.47%* |
| *36-40 years* | *22.22%* |
| *40- 45 years* | *18.69%* |
| **Industry** |  |
| ***Manufacturing*** |  |
| *Electronic and electrical manufacturing* *products* | *27.27%* |
| *Pharmaceutical firms* | *12.12%* |
| *Automobiles* | *10.10%* |
| ***IT Industry*** |  |
| *IT solutions provider* | *18.18%* |
| ***Healthcare*** |  |
| *Healthcare services* | *9.60%* |
| ***Services*** |  |
| *Aviation* | *10.10%* |
| *Banking* | *12.63%* |
| **Position in the company** |  |
| *Operations manager* | *25.76%* |
| *Supply chain practitioner* | *11.62%* |
| *HR manager* | *33.33%* |
| *IT expert* | *8.08%* |
| *Strategist* | *9.09%* |
| *Corporate trainers* | *5.56%* |
| *Finance Managers* | *6.57%* |
| **Experience** |  |
| *>5 years* | 38.59% |
| *6-10 years* | 21.62% |
| *11-15 years* | 24.44% |
| *> 15 years* | 15.35% |

The sample undertaken comprises 198 employees working in a multinational firm located in North India. The employees belong to the industrial and service sector, covering a wide variety of services. Based on gender, 56% of the sample are males. The mean age of the employees is 30.75 years, distributed over the age groups > 30 years (11.62%), 30-35 years (47.47%), 36-40 years (22.22%), 40- 45 years (18.69%). The offline survey was carried out in January 2021, and the online survey was carried in February 2021. The rate of response was limited to 62% in the field survey, and 3 per cent was the rejected rate due to errors made in the questionnaire. The online survey was conducted through a google form, and thus there was no rejection as all the questions were compulsory for the submission. The questionnaire included a cover letter defining the objectives of the study. For speedy response, the questionnaire was shared with the personal contacts in the organisations and requested to forward the same in their network to reach a large number of respondents. The respondents belonging to managerial positions were targeted. The respondents mainly belonged to the IT, consultancy, healthcare, and manufacturing industries. A sample of 198 professionals is adequate (Hair et al. 2014). The selected sample is varied on several dimensions such as industry, number of employees, number and type of products manufactured, designation, and experience. The missing values are found in the offline questionnaire, whereas the online questionnaire prohibits the missing values and makes the responses valid for usage. The questionnaire is exhibited in the Appendix section (Table A1). For the internal consistency reliability check, Cronbach’s alpha coefficient was calculated. As it is the most used tool to test the reliability of Likert scale-based data (Nunnally and Bernstein, 1994). The values of factor loading are checked for convergent validity; If the values are greater than 0.5, the scale is considered to have convergent validity. By measuring the Cronbach’s alpha values for each component, the instruments’ reliability and inner consistency test were assessed in the current study. Using the inter-item correlation study, testing for the validity of the model was conducted. KMO and Bartlett's test results are shown in Table 3.

**Table 3**: KMO and Bartlett's test

|  |  |  |
| --- | --- | --- |
| **KMO and Bartlett's Test** | | |
| Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy | | 0.810 |
| **Bartlett's Test of Sphericity** | Approx. Chi-Square | 418.867 |
|  | Df | 237 |
|  | Sig. | 0.000 |

*4.2 Non-response bias*

The primary data was received in two phases. The early responses (76) and the late responses (122) were checked using an independent *t*-test for non-response biases. There was no significant difference found between early and late responses.

The value of Chi-square was computed to confirm the proposed model in addition to Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Non-normated Fit Index (NFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) (Hair et al., 2014). The impact of SHRM and I4Te on employability has been analysed using standardised regression coefficients obtained through SEM analysis. For conducting the test, IBM SPSS 26 and IBM AMOS 25 were employed.

1. **Analysis and Results**

The proposed model is checked using SEM. The measurement model is shown in Figure 1

The CMB, measurement model, hypotheses testing is conducted to calculate the following results:

***5.1 Measurement model***

H1(a)

FL1

FL2

FL3

TR3

TR2

TR1

EP

EE

EP1

EP2

EP3

EE1

EE2

EE3

H1(b)

H1(d)

ES1

ES2

ES3

ES4

ES5

ES6

H2

IT1

IT2

IT15

IT3

IT4

SHRM Practices

FL

TR

ES

I4Te (IT)

IT6

H1(c)

**Figure 1:** Measurement model

The data is collected from professionals from different industries. As the industries are diversified, there is a need to check the bias. Thus, Common Method Bias (CMB) was checked using Harman’s single factor. The values of Skewness and Kurtosis were calculated to check the normality in the dataset. Composite Scale Reliability (CSR) followed the normality test with a threshold value of 0.70. The convergent validity (factor loading > 0.50), Average Variance Extracted (AVE > 0.50) and discriminant validity were calculated for the measurement items.

***5.2 Common Method Bias, Normality and Reliability***

For normality check, Skewness and kurtosis were calculated. Based on the values obtained, the values of Skewness and kurtosis both were less than 1. The value for Mahalanobis d-squared was less than 48 (24x2). Hence the dataset showed the normality and could be tested for the maximum likelihood estimation. This study had an acceptable level of reliability ranges from 0.85 to 0.93. Cronbach’s alpha values were computed and found to be more than 0.70. Common Method Biasness (CMB) is used to check the correlations among the observed variables (Malhotra et al., 2006).

The mean response of the constructs was checked using ‘Kolnogorov- Srimov’ test (Wallace and Mellor, 1988) and found that there was no significant difference. The CMB adjusted estimates were compared with the original structural model parameter estimates. The path coefficient values were stable after the correction for CMB, indicating the proposed model was unaffected by the CMB.

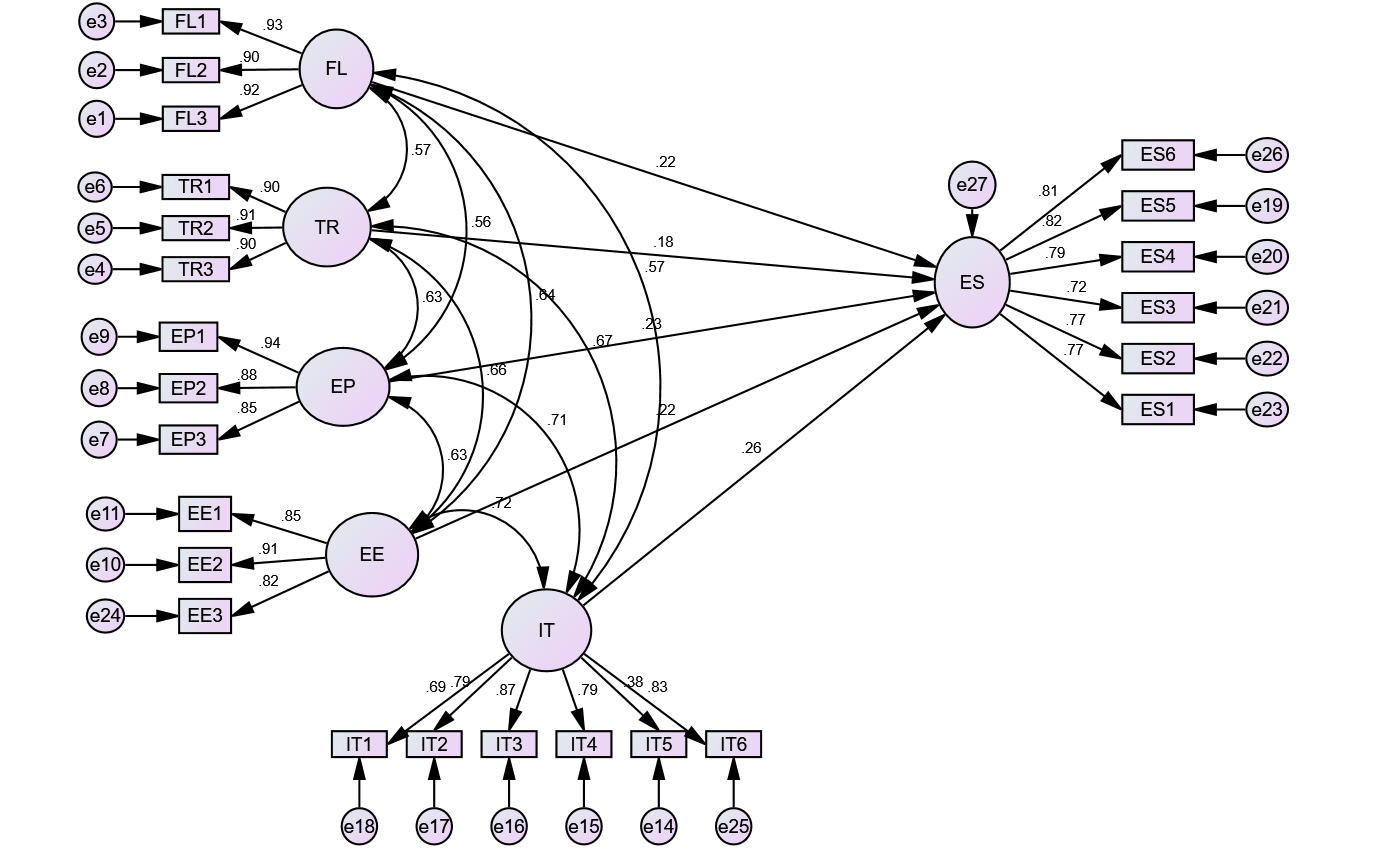
**Table 4**: Convergent and Discriminant validity results

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **MSV** | **MaxR(H)** | **IT** | **FL** | **TR** | **EP** | **EE** | **ES** |
| **IT** | 0.859 | 0.504 | 0.298 | 0.866 | **0.710** |  |  |  |  |  |
| **FL** | 0.938 | 0.836 | 0.248 | 0.955 | 0.273 | **0.914** |  |  |  |  |
| **TR** | 0.925 | 0.803 | 0.113 | 0.929 | 0.279 | 0.317 | **0.896** |  |  |  |
| **EP** | 0.896 | 0.741 | 0.117 | 0.902 | 0.301 | 0.313 | 0.250 | **0.861** |  |  |
| **EE** | 0.792 | 0.563 | 0.298 | 0.835 | 0.546 | 0.498 | 0.336 | 0.342 | **0.751** |  |
| **ES** | 0.874 | 0.545 | 0.108 | 0.906 | 0.155 | 0.319 | 0.228 | 0.329 | 0.129 | **0.738** |

The values obtained for CSR and AVE are shown in Table 4, indicating that there are no convergent validity issues in the measurement model (Factor loading > .50; CSR > .70 and AVE > .50). The values of factor loadings are higher than the cut-off value indicating that results are consistent (Hair et al., 2017). Additionally, CFA is carried out to test the hypothesized model.

***5.3 Structural model***

The effects of SHRM, I4TEs on ES are tested through a complete structural model. The model includes 6 first-order constructs. The latent constructs are developed through 24 observed variables. The SEM method applied for testing the hypothesis is exhibited in Figure 2.



**Figure 2**: Structural model

*Hypothesis 1(a)* exhibits the relationship between the FL and the ES. The hypothesis was tested using the SEM model. Table 5 shows that FL positively influences ES (*p< 0.001*). Hence, hypothesis 1(a) can be supported.

*Hypothesis 1 (b)* proposed that greater inclusion of training practices will have a positive effect on the ES of the employees. The values are presented in Table 5, showing that TR is significantly influencing ES (*p < 0.001*). This supports hypothesis 1(b).

*Hypothesis 1 (c)* proposed that EP will have a significant impact on the ES of the employees. Table 5 shows that EP is significantly influencing ES (*p < 0.001*). Thus, hypothesis 1(c) can be accepted.

*Hypothesis 1(d)* proposed that greater EE will have a significant impact on the ES of the employees. Table 5 shows that EE influences ES (*p < 0.001*). Thus, hypothesis 1(d) can be accepted

*Hypothesis 2* proposed that higher IT will have a positive impact on the ES of the employees. Table 5 shows that IT is significantly influencing ES (*p < 0.001*). This supports hypothesis 2.

**Table 5**: Hypotheses results

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Hypotheses** | **Estimate** | **S.E.** | **C.R.** | ***P value*** | **Result** |
| **ES<--- FL** | 0.185 | 0.04 | 4.19 | *\*\*\** | *Significant; Hypothesis supported* |
| **ES <--- TR** | 0.143 | 0.05 | 3.06 | *\*\*\** | *Significant; Hypothesis supported* |
| **ES <--- EP** | 0.202 | 0.05 | 3.75 | *\*\*\** | *Significant; Hypothesis supported* |
| **ES <--- EE** | 0.192 | 0.06 | 3.29 | *\*\*\** | *Significant; Hypothesis supported* |
| **ES <--- IT** | 0.254 | 0.07 | 3.82 | *\*\*\** | *Significant; Hypothesis supported* |

The CFA has confirmed the constructs and tested them by SEM. The CMB analysis was conducted to check the discriminant validity of the scales. A full measurement model was tested to identify the correlation among the variables. Error terms were free to covary between one pair of willingness for mobility items to improve fit and help reduce bias in the estimated parameter values (Reddy, 1992). Multiple fit indices were calculated to determine how the model fitted the data as recommended by Hu and Bentler (1999). The five-factor model showed a good model fit (χ2 = 418.867; df = 237; GFI =.905; AGFI= .895; NFI= .909; RMSEA=.06; CFI= .969; RMSEA = .048) is presented in Table 6.

**Table 6:** Model fit summary

|  |  |  |
| --- | --- | --- |
| **Fit indices’ analysis of the research model** | **Model fit** | **Reference index** |
| χ2/df | 1.45 | <3 |
| Goodness-of-Fit Index (GFI) | .905 | >0.9 |
| Adjusted Goodness-of-Fit Index (AGFI) | .895 | >0.8 |
| Normed Fit Index (NFI) | .909 | >0.9 |
| Tucker–Lewis Index (TLI) | .964 | >0.9 |
| Comparative Fit Index (CFI) | .969 | >0.9 |
| Root Mean Square Error of Approximation (RMSEA) | .048 | <0.05 |

1. **Discussions of Findings**

The study assesses the SHRM practices and their effect on the ES of the employees. The theoretical model is tested to identify the extent to which the SHRM practices affect employability skills. The current study has contributed to the wider debate on increasing employability by strengthening the SHRM practices.

This study particularly has analysed 4 main SHRM practices (Flexibility, Training, Employee participation, Employee empowerment) and Industry 4.0 technologies on the employability skills. The previous studies discussed the combined role of supervisors, managers, and employees in enhancing the ES, without considering the interaction between the roles (Van, 2005; Van, 2011). The findings suggest that all 4 SHRM practices have a positive relation to ES.

The concept of soft skills is the new essential for the workforce as these skills are resilient (Frey and Osborne, 2017). It is very much required by the organisations to remain competitive in the market and need to become responsive, flexible as per the changing environment. Employees are the resources required to be developed continuously (Stokvi and Sukalova, 2020). Thus, creating favourable conditions for the development of employees and careers will increase the overall performance of the organisation.

The first hypothesis suggests that flexibility in the organisation will provide more opportunities to the employees for developing themselves. This is in line with the previous research that suggests human resource flexibility affects performance outcomes in the organisation. With flexible working hours, employees may have more time for their skill development (Everett, 2020; Karman, 2020; Ybema et al., 2020). This sustainable practice will provide a comfortable and safer work culture and save the organisation’s resources. The flexibility will bring less consumption of renewable resources, saves cost and time too. Also, with flexible work culture, skilled employees in the future will be able to achieve more economic and environmental outcomes.

The second hypothesis indicates that employee training on sustainable practices is an investment that positively influences the economic outcomes of the organisations. It improves the organisation’s image as well as employee development. The digital environment of the organisation needs to understand the detailed knowledge of the skill set required in training programs that aims to enhance the sustainability practices and career opportunities to upskill and reskill (Cedefop, 2019). The organisations surveyed in the study are committed to the adoption of environment and skills through training programs. The TR programs will be able to upgrade the employee’s competencies to recognise the sustainability practices and its implementation (Perron, Côté and Duffy, 2006; Chillakur and Vanka, 2016; Almarzooqi et al., 2019). It is the prime responsibility of the organisation to provide the right information in the right way. The training programs on sustainability practices with advanced technologies like Augmented and Virtual Reality (AR/VR) will drastically change the organisation performance. The AR-enabled training has been adopted by the organisations as it provides information with utmost clarity and practical demonstration. Along with I4Te, the organisations need to develop their employees towards sustainable solutions and technologies that aim for a greener and sustainable future.

The third hypothesis exhibited that EP may boost up ES. This has been seen in the previous studies where employees are involved in working with new tools, technologies, new channels for developing a participative organisation culture. EP in sustainable practices may develop the organisation a place for knowledge sharing.

The fourth hypothesis showed that EE positively affects ES. With more opportunities for employee participation and empowerment, the organisation will develop skilled manpower for the future. This is in line with the previous studies which shows that empowering employee positive outcomes for the organisation (Chillakur and Vanka, 2016; Almarzooqi et al., 2019). EE is directly linked to employee commitment, satisfaction, effectiveness, and productivity as shown in the previous studies based on institution theory (Meyerson and Kline, 2008; Yao et al., 2013). With the changing environment, several online platforms have been evolving to enhance the participation among the employee and the organisation. Moreover, decision support systems/ expert systems are also helping the employees in their decision-making during uncertainty. The empowered dynamic environment brings optimum utilisation of resources such as energy, raw materials, water etc., and helps the organisation to build a sustainable eco-system for the future.

The fifth hypothesis has proven that I4Te is one of the most significant factors for raising the ES of the employees. The SHRM practices are meant to bring sustainable development for the economy, but achieving the same is highly dependent on the I4.0 inclusion in the organisation (Caputo et al., 2019). The organisations need to reconsider the current innovative skill development and advance I4Te to be implemented in the business processes for enhancing the performance outcomes. The skill anticipation has been performed, but mainly it is for the macro level, and very far from the company itself. Therefore, organisations struggle to reshape their skill inventory, job profiles, structure and match it with the requirement (Fulmer and Ployhart, 2013; Becker and Gerhart, 1996). With the I4Te revolution, the information has been shared in real-time and helps the employees to make appropriate decisions on time. It also helps in anticipating skill inventory, re-structuring, manpower planning etc. that saves time and cost for the organisation. It also provides satisfaction to the employees in achieving their desired outcome. Previous work of I4Te has shown that these technologies affect employees especially the job profiles (Chryssolouris et al., 2013; Fareri et al., 2020). The changing technological and social environments affect the working conditions and competencies of the individual (Lopez-Cabrales and Valle-Cabrera, 2020).

Employability skills including core, technical and personal attributes are the ongoing practices that need to be enhanced through continuous learning. Today’s society is often described as a “Society of Knowledge”. This concept suggests that knowledge up-gradation of the employees is the key element for organisational as well as individual development. The TR, FL, EP and EE are the key elements for improving the skills, personality, and competencies of employees. ES can be developed by the organisation efforts through proper training and development programs (Webster and Ivanov 2019). Acquisition of the people skills such as social networking, counselling, and collaboration will be highly demanded in the forthcoming years as technology is yet limited with the capability of emotional needs of the human beings (Kolbjørnsrud et al. 2016). Thus, these SHRM practices will play a key role in developing ES in the employees.

* 1. ***Theoretical Implications***

The proposed theoretical model contributes in two main areas: Sustainable Human resource management and Industry 4.0 adoption. The current study develops a model that makes it possible for the researchers to comprehend the impact of I4Te and SHRM practices on the ES of the employees. The findings are helpful for the decision-makers to take actions for developing a sustainable eco-system in their organisation where digital technologies like Industry 4.0 will enhance the retention, association, and satisfaction among the employees. The organisations should accept that the employees are the key stakeholders that have specific interests and need such as fair conduct, work quality, long term employment, care, wellbeing, empowerment etc. and it is the prime responsibility of the organisation to take care of the employees and develop them continuously. Thus, this study intends to study the stakeholder’s perspective on the SHRM practices and the employability in the industry 4.0 era. Using stakeholder theory in the study, the organisation must take care of the employees that will enhance their performance and healthy relationship with the organisation (Guerci and Shani, 2013; Sorribes et al., 2020). The literature is limited in the area of SHRM practices and I4.0 impact on human resources as well as their employability skills. Thus, it needs more research studies in future to explore the effect of SHRM practices. Based on institutional theory, the current study contributes to indicate the relationship between employee development and SHRM practices. The SHRM will enhance the effects on the long-term association of the employees and their skill development.

* 1. ***Managerial Implications***

In addition to the research contribution, the current study offers insights for the organisations to perform their actions. There is a need to enhance the sustainable practices among the employees and to enhance their skills for the digital competitive world. SHRM practices TR, FL, EE, and EP will decrease the use of energy, organisation renewable resources, and carbon emissions. HR is considered as the main changing agent in society and thus organisation’s efforts for practices sustainable practices influencing employability will bring a big change in the future. SHRM aims to enhance the effects on the long-term association of the employees and their skill development.

Considering the results, the SHRM practices and I4Te influences the employee’s ES and can enhance the employee’s core, IT skills and personal attributes. The positive work culture that promotes employees’ caring in terms of health and safety contributes to employees’ satisfaction and brings long term association with the employees. This will also increase ES and improvement of career opportunities that improve employees’ engagement with the organisation. The I4Te is needed to educate HR of the organisations towards the adoption of sustainable practices and advanced technologies to enhance organisational performance.

Today, multifaceted problem-solving skills and critical thinking is highly demanded in addition to soft skills. The results suggest that the employability skills can be developed by the organisation efforts through SHRM practices that will consequently support decision making in the organisation. The managers can adopt SHRM practices including TR, FL, EE, EP to enhance the ES of the employees.

1. **Conclusion, Limitations, and Future Research Directions**

SHRM is an emerging area that connects organisations’ sustainability with the roles and responsibilities of humans. The current study was conducted in the area of SHRM by including multiple constructs and an SEM model. The study has revealed that the changing landscape is prompt and requires skill development through I4Te with SHRM. The majority of the organisations, irrespective of their size, must update their inventories of skills and competencies to become sustainable. The literature supports the fact that research on human resources and their employability is scarce till now. Hence, the findings from the current study contribute to bridging this gap and builds a better understanding of SHRM practices and their impact on ES. The effect of TR, EE, EP, FL, and I4Te on the ES has been found positive in the current study and thus suggests that if organisations need to build sustainable ecosystems, must focus on SHRM practices. The efficiency and effectiveness in the decision-making have been enhanced drastically due to shared information through I4Te. Thus, HRM 4.0 is a new area where the key focus is on automation and strategic issues in place of repetition. The digital transformation has also enforced firms to adopt online tools, methods, and services for optimising their decision-making. The organisations must acknowledge the significance of flexibility, wellbeing, participation, competency and provide more opportunities to enhance employability skills for their employees. The core skills, technical skills, and personal attributes in employees for analytical and decision-making skills are needed to be developed. There is no doubt in the fact that ES has been evolved across the years from an ability to get initial employment to become competent, enhances skills & capabilities among the employees to manage their careers and future actions. SHRM practices can contribute to shaping the new mindset and their perceptual development. It will fill the existing gap between the current skills of the employees and what is expected to gain in the future.

There are few limitations also. The current study has undertaken only 4 main SHRM practices only and thus the future studies can be expanded with the other practices. The respondents were mainly from managerial positions in the organisations. Thus it might be possible that their position affected their answers. The employability concerns could be better understood with a large group of people with different positions. The dimensions of SHRM that are identified are from the perspective of countries that are on the way to sustainable development. Since India is a developing country and struggling with many issues such as environmental sustainability, resource security, less skill labour etc. and may face constraints to adopt SHRM practices thoroughly. The context of countries may vary, but the study can be generalized to other developing countries that are moving toward sustainable development. Future studies can extend the current study in identifying the effect on the employee performance, efficiency, and organisation performance outcomes based on SHRM practices.

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**APPENDIX-A**

**Table A1:** Questionnaire items

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Construct** | **Item** | **Item’ Description** | **Likert Scale** | | | | |
| **1** | **2** | **3** | **4** | **5** |
| **Flexibility** | FL1 | Does your organisation practices employee rotation on a regular basis |  |  |  |  |  |
| FL2 | Do you have work from home facility as per your requirement to save time and cost |  |  |  |  |  |
| FL3 | Does your organisation have flexible work schedule as per the employee’s convenience |  |  |  |  |  |
| **Training** | TR1 | Have you been provided training on sustainability to enhance your current knowledge and skills |  |  |  |  |  |
| TR2 | Does the training enhance employees’ collective organisational behavior towards the environment |  |  |  |  |  |
| TR3 | Does Training helps you enhance your skills and competencies in long run |  |  |  |  |  |
| **Employee participation** | EP1 | To what extent the organisation provides you freedom to do your work? |  |  |  |  |  |
| EP2 | To what extent do you have control on decisions which affect your work? |  |  |  |  |  |
| EP3 | How much your superiors are receptive and listen your ideas and suggestions. |  |  |  |  |  |
| **Employee Empowerment** | E1 | To what extent you have essential autonomy in determining to perform my work? |  |  |  |  |  |
| EE2 | To what extent you can make a decision on your own to perform duties |  |  |  |  |  |
| EE3 | To what extent you have significant opportunity for independence in doing your work |  |  |  |  |  |
| **Industry 4.0 Technologies (I4Te)** | IT1 | The Internet of Things (IoT) has been implemented /implementing to enhance my skills and competency |  |  |  |  |  |
| IT2 | The Big Data Analytics (BDA) has been implemented /implementing to enhance my skills and competency |  |  |  |  |  |
| IT3 | The Cloud Computing (CC) has been implemented /implementing to enhance my skills and competency |  |  |  |  |  |
| IT4 | The Artificial Intelligence (AI) has been implemented /implementing to enhance my skills and competency |  |  |  |  |  |
| IT5 | The Robotics (RO) has improved/improving has been implemented /implementing to enhance my skills and competency |  |  |  |  |  |
| IT6 | The Augmented Reality (AR) has been implemented /implementing to enhance my skills and competency |  |  |  |  |  |
| **Employability Skills** | S1 | With the changing environment, my problem-solving skills have been enhancing day by day |  |  |  |  |  |
| S2 | I am easily adaptive to the work environment anywhere |  |  |  |  |  |
| S3 | My organisation supports to continue my advance studies |  |  |  |  |  |
| S4 | My information and communication technology (ICT) skills make me best fit for the digital world |  |  |  |  |  |
| S5 | I am very positive towards the changing environment of my organisation |  |  |  |  |  |
| S6 | I believe in developing teams for enhancing organisation performance |  |  |  |  |  |