

Assessing the Impact of e-Training Technology on Engineering Personnel Agility in Selected Hydroelectric Power Plants in Himachal Pradesh of India

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Abstract

The technology has been changing continuously and creating impact on business environment. Every organization has to survive by adopting latest technology for survival in the market. The purpose of this study is to know e-Training technology in enhancing Agility in Engineering personnel working in selected hydroelectric power sectors in Himachal Pradesh of India. Organizations require an 'agile' 'flexible', 'tactically trained', 'resilient human resources' to thrive in crisis. To adopt latest technology and awareness about changes in machinery in hydroelectric power sector, a systematic study is required to develop Engineering personnel agility through e-Training programs continuously. Specially to save personnels' valuable time, e-Training technology is a convenient way to learn about the latest hydroelectric power technology in the market and is beneficial in bringing agility in Engineering personnel with technical backgrounds to adopt e-Training technology. Most of the hydroelectric power plants in India have adopted e-Training methods to impart training for their technical staff. To ensure consistent progress of the hydroelectric power units, enhancing agility in Engineering personnel is required. The present study is to know the development of agility in Engineering personnel through e-Training technology in thriving challenges in selected hydroelectric power units in Kullu and Kinnaur Districts of Himachal Pradesh in India. A cross-sectional survey conducted through personal interviews and observations for Engineering personnel with technical backgrounds of different cadres in five power plants located in selected units. Results of the study shows that, adopting e-Training technology by Engineering personnel with development of agility, which ultimately motivated them to face and thrive in challenges successfully and to upgrade knowledge about technological changes.

Keywords: E-Training, Human Resource Development, Hydroelectric Power Plants, Personnel Agility, Technology, Technology Adoption.

Introduction

World has been experiencing technological changes, advancements and market competition; all have an impact on survival of organizations. Engineering personnel with technically qualified personnel must have to adapt to technological changes to remain alive in the market. Technology has an impact on both business entities, hydroelectric power sector, and society. Electronic-Training technology plays an important role to enhance agility in Engineering personnel, develop various technical skills to keep them ever ready with competitive spirit to handle turbulence situations in the market. Engineering personnel knowledge, flexibility, motivation and health awareness/fitness contribute to Engineering personnels' ability to adapt to technological advancements. The personnels need to be flexible to deal the changes with a positive and creative manner. They need to have confidence, purposefulness, and adaptability.

Human Resource Development (HRD) can play a vital role to cope with the crisis through enhanced technical agility, flexibility, and motivation in Engineering personnel to develop competitive advantage and high personnel morale. HRD is conceptualized as a process that occurs in workplace settings and is designed to facilitate individual and group learning in the context of jobs, work, and careers. HRD focuses on organizational learning, change and development and exclusively on work-related issues within organizations. It is less concerned with societal and global issues (Hamlin and Stewart 2011). Researchers defined HRD as the process to increase the capabilities and values of human resources. When personnel engaged in any organization they enter the organization with their pre-existing traditional values, attitudes, and beliefs. HRD through various training programmes develops in personnel technical skills, behavioural skills, knowledge, attitudes/behaviour and capabilities, flexibility, and competencies.

Personnel agility is defined as agility builds upon dynamic capabilities possessing personnel and organizations to combine, build and adjust with internal and external competencies to address fast changing environments (Teece et.al 1997). Personnel's enhanced ability to respond to changes in a right time with right manner and adapt required changes and get success (Kidd 1995); agile personnel with broad vision can easily overcome the adverse situation (Zhang and Sharifi 2000).

Most of the Hydroelectric Power Stations are in hilly areas, very hard locations and far off places from main cities, where weather conditions are adverse and extreme. Travelling in peak winter period is not at all possible from their locations. To acquire training physically, personnel need to travel a long distance, thereby causing vehicular pollution, creates adverse impact on environment. In Hydroelectric Power Stations Engineering personnel with technical backgrounds required for operating Power Stations continuously. In Executive Cadres-Engineers and high ranks with Mechanical/ Electrical/ Electronics & Communications background and in Non-Executive Cadres-Electrician, Fitter, Machinist, Crane Operator, Gate Operator, Rigger, Welder, Grind-man, DG Operator. The technical/non-technical personnels are assets for Hydroelectric Power Stations; they work in shift system round- the-clock and their presence is very much required. To make this possible without sending them on very long distances for training programs, it is very much required and convenient to have training through e-Training method at their workplaces, which is very much convenient and advantageous. In the past manual mode was used to operate Hydroelectric Power Stations and at present, the machines are operated on semi-auto mode & auto mode through software programs & SCADA. The training through electronic mode is required for the personnels on machinery up-gradations, Turbine Governing System, Rotor, Generators, Excitation System, to run and stop units as per power requirement & Control/SCADA operating system, etc. and on General Safety, Electricity Safety & Basic Fire Safety.

Brief in respect of selected power plants of Kullu and Kinnaur Districts of Himachal Pradesh, India:

Karcham Wangtoo Power Plant is a Mega Project and is run of the river hydroelectric power station on the Sutlej River in Kinnaur District of Himachal Pradesh State of India. The dam and power station are located between the villages Karcham and Wangtoo where the plant also gains its name. The power station was commission in the year 2011.

Door Sanchar Power Station is a Private Limited power unit incorporated in 2008 and is a Non-Government Company. This hydroelectric power station is located in Kinnaur District of Himachal Pradesh State of India.

Kanchan Junga Power Station is a private limited company incorporated in 1991. This power plant is located in Manali, Kullu District of Himachal Pradesh State of India.

Aleo-I Manali Power Plant is located at Aleo village close to Manali, Kullu District of Himachal Pradesh State of India. This is a small hydroelectric power plant. This is run of the river hydroelectric power plant.

Aleo-II Manali Power Plant is located at Aleo village close to Manali, Kullu District of Himachal Pradesh State of India. This is a small hydroelectric power plant. This is run of the river hydroelectric power plant.

Rationale of the study

Technology has been changing and advancing from time to time and creates its influence on the business world. The aim of this study is to analyse developing agility through e-Training technology in Engineering personnel having technical backgrounds. To know how it helps to thrive negative impacts of technological changes and advances in the business market.

The present study is to understand and to know: how the organizations will create agile personnel with Engineering cadre teams by imparting e-Training to personnels to enhance their agility when technology has been changing rapidly. They will acquire how to satisfy consumers, when consumer preferences are undergoing changes with time; and how the organization will flourish as excellent organization and survive in crisis. The objective of present study is to analyse the conceptual relationship between e-Training and agility of personnel with Engineering backgrounds. The study is descriptive in nature and will help to describe the concept of personnel agility from different organizational perspectives. This study would assist hydroelectric sector to understand by enhancing agility levels through e-Training leads to adaptability to new technology in the business market to compete in the business market (Mereu 2018).

Research problem statement

The researchers found that most existing training effectiveness measures consist of self-reports that do not focus on the effect of learning programs on adaptability when technological changes take place. E-Training contributes to agility enhancement of learners for smooth adaption of technology.

Review of Literature

Organizations' survival is continuously influenced by technological changes. The unpredictable nature of the world is making the business world increasingly Volatile, Uncertain, Complex and Ambiguous (Sarkar 2016). For survival in the competitive business world, organizations need to keep their personnel ready with agility through e-Training to accept and adapt technological changes positively. Organizations need to train their personnel on technical and soft skills to face crisis. The personnel are precious assets of the organization, and they play a key role in surviving the organization and contribute for organizational development. To acquire specialized skills and to adapt to technological changes, organization needs to provide training to its personnel (Rao 2013). Training surely enhances an individual's capability (Leonard and Nadler 1984) and it is a systematic process to impart knowledge to streamline the behaviour and to enhance the talents of personnels and results in performing their jobs effectively (Garavan et al. 1995). Physical boundaries decrease flexibility and movement: 'If we lack flexibility, we lack responsiveness to the ocean we swim in and thus, we fail' (Lee and Hassar 1999). Information, communication, and mobile technologies need to be clubbed with a personnel's ability for faster and smoother action (Goldman and Nage. 1993; Kidd, 1994; Yousuf et al. 1999). The IT infrastructure and its design allows in creating structures that are fluid and flexible and adaptive to dynamic environments (Miles et at. 1997; Kraut et al. 1998). According to Breu et al. 2002, "Environmental turbulence compels organizations to become more and more agile in terms of the speed and flexibility which they adapt their business models and objectives. The five capabilities of personnel agility are Intelligence, Competencies, collaboration, culture, Information System. The enabling role of IT for personnel agility requires to be considered. The new technologies need to be adapted in organizations to build network among the personnel to improve their abilities to collaborate and share knowledge and to access the information resources from trainers virtually".

Digital technologies are vital for training, adult education, and human resource development in many organizations (Gegenfurtner *et al.*, 2018; Thalhammer 2014). E-learning is also referred to as online learning or electronic learning. Teaching-learning process adopted by making use of electronic technologies and used as substitute of traditional classroom (Sapkota & Narayangarh 2020). Computer-Mediated Communication (CMC) systems (Kerr and Hiltz, 1982, p. 2) have been an important support to online learning. The forms of CMC are usually defined in two categories: asynchronous (delayed time) communication and synchronous (real-time) communication (Romiszowski and Mason 2004). Synchronous-communication technologies include voice-over-internet protocol (VoIP), instant messaging, and video conferencing, whereas asynchronous-communication

technologies rely mainly on e-mails, bulletin boards, and blogs. E-Training is a new approach to impart training to personnels using the internet technology.

In 1990s the agility theory was got priority in manufacturing firms and was soon extended to the entire business world, where it has been defined as an organizational agility to respond speedily to market changes and to face unexpected changes for survival during unexpected threats from the business environment (Huang 1999). Agile personnel show positive attitude towards acquiring training, their self-development, problem solving capability, flexibility with change and latest technology, creativity, and readiness to accept new responsibility (Plonka 1997). According to the authors, to develop agility in oneself, one must approach adversity with a positive attitude. One must be agile to grow when confronted with challenges and adversity. Human beings' agility can be observed in relation to their current situation and role, as well as the society in which they live and the organisations in which they work. The process of adapting to adversity, shock, disaster, pressures, or significant sources of stress - such as family problems, serious health problems, or workplace and financial stressors (The American Psychological Association 2017). The important attribute of agility is the effective response to change and uncertainty (Goldman et al. 1995). Agility indicates proactive response to changes (Bessant et al. 2001); Agility is the ability to respond to unpredictable changes with speedy response and to acquire benefits (Erande & Verma, 2008. Agility has two benefits speedily responding to dynamics and threats in the best possible manner and a shortest time (Rajan et al 2012; Sherehiy 2008) and identifying and treating it as opportunity in the most effective manner within time (Sharifi and Zhang, 1999). In crisis and technology changing situations, organizations need to be ever ready with agile personnel with Engineering cadres to face challenges of business environment by quickly responding to the changes and compatibility with environment and which allows organization to improve its efficiency (Yeganegi and Azar 2012). According to Vinodh et. al (2012), the agile qualities of personnel agility are “flexible personnel to accept the adoption of latest technology, multi skilled personnels, education and cross training, personnel’s involvement & teamwork”; “multi-tasking, job enrichment and skill-based pay (Sawhney and Piper 1999).

The dimensions of agile working are ability to quickly change direction, to speed up operations, to scan the business environment/anticipate, to empower the customers, adjustability tactics and operations (flexibility), integrating processes within and across organizations (Gligor et.al 2019). In order to smoothly adapt changes, personnels need to work in multiple roles in different capacities across levels and often move from one role to another very quickly. Agile personnel are a well-trained and flexible personnel and can overcome VUCA times and contribute for organization’s survival (Katayama and Bennett 1999). According to Dyer and Shafer (2003) “agile personnel have “the proactive, adaptive and generative behaviours. Proactive behaviour consists of two aspects: initiate and improvise. Proactive initiatives mean an active search for opportunities to contribute to organizational success and take the lead in pursuing those opportunities that appear promising”. Management practices can surely influence personnel capabilities to be agile (Kathuria and Partovi 1999); and Sumukadas and Sawhney,2004). Agile personnel are said to be more flexible and rapidly perform and effective in any situation. Agile personnel are also expected to be effectively take part in any collaborative environment (Forsythe 1997), whether it is a cross-functional project team, collaborative ventures with other companies, or a virtual organization (Van & Veatch 2002). They have quite responsiveness to external changes (Breu et al. 2002); good in reading external changes like customer requirements, new business opportunities and competitor strategies, flexible business objectives and acting speedily in line with new and desired business directions (Duncan, 1972 and Huang 1999). Personnel with agility demonstrate two important behaviours, reacting to the situation and adaptability to changes required exactly well within time (Chonko and Jones 2005). The personnel can grab the opportunity and own the responsibility in discharging duties in adaptability to convert turbulence to successful situation for the firm (Breu et al 2002). Organizations that invest in building these changed capabilities in personnels may benefit from being able to overcome organizational change (Muduli 2013) successfully and positively.

According to Muduli (2013) “the agile personnel was considered from ‘an operations point of view’; now the management’s action is required to focus mainly on imparting training to make them agile personnel; personnels’ motivation, pay package and communication surely promotes enhanced Personnel Agility”. Agile personnel can play a very important role for any organisation’s productivity, and they can face global challenges in almost all sectors (Alavi and Wahab 2013). They acquire speedily new skills, technical, functional, information technology, soft skills, adapting to new work environments, and information access with customers, accounting, business

performance and management information (Breu et al. 2002). The characteristics of agile personnel are imbibing information technology skills, technical knowhow and negotiating skills, team spirit, higher strategies, multifunctional capabilities, self-directed & motivated to handle the VUCA situations (Gunasekaran 1999). The organizations with enhanced agility show that they are ever ready to adapt technological changes and perform effectively in rapidly changing environments (Dove 2002; Well, et.al 2002; Sambamurthy et.al 2003; Ambrose and Morello, 2004). The personnels are required to be in a mode of constantly changing capability, to scan environmental changes, competitors' actions, changes in consumer preferences, changes in economy, changes in regulatory/legal framework, technological changes & advancements; responding by focusing on achieving forecasted goals by way of adjustment of operations as required in accordance with the situations (Overby et al. 2006). The enhanced agile personnel's involvement practices support organization's flexibility (Kathuria and Partovi 1999).

Objectives of the study

The objectives of present study are to analyse the conceptual relationship between e-training and development of agility of Engineering personnels of selected power plants in Himachal Pradesh. The study is descriptive in nature and will help to describe the concept.

- a. *To explore and corelate between e-Training technology factors on development of agility in Engineering personnels of selected hydroelectric power plants.*
- b. *To analyze the effectiveness of e-Training technology adaption in Engineering personnel of selected hydroelectric plants in Himachal Pradesh of India.*

Methodology

The study was conducted in Kullu and Kinnaur Districts of Himachal Pradesh by adopting Exploratory and Ex-post facto research designs (Giuffre 1997). The information was gathered through personal interviews with a pre-structured interview schedule that included closed-ended questions. It consists of 39 items in total, presented in the form of a five-point Likert-scale format, and covers various e-Training, agility and resilience factors. The responses were then summarized and analyzed statistically using techniques such as frequency, percentage, standard deviation, and smart-PLS.



Figure: 1 Map of Kullu District of Himachal Pradesh

Kullu is a district in Himachal Pradesh, India. It borders Shimla district to the south, Mandi and Kangra districts to the west, and the Lahaul and Spiti district to the north and east. The largest valley in this mountainous district is the Kullu Valley. The Kullu valley follows the course of the Beas River, and ranges from an elevation of 833m above sea level at Aut to 3330m above sea level at the Atal Tunnel South Portal, below the Rohtang Pass. The town of Kullu, or simply Kullu, located on the right side of the Beas River, serves as the administrative headquarters of the Kullu district. The Kullu district also incorporates several riverine tributary valleys of the Beas, including those of the Parvati, Sainj, and Tirthan rivers, and thus some regions somewhat distant from the Kullu valley. The economy of the district relies mainly on horticulture, agriculture, tourism, and traditional handicrafts.



Figure: 2 Map of Kinnaur District of Himachal Pradesh

Kinnaur is about 235 km (146 mi) from the state capital, Shimla, located in the northeast corner of Himachal Pradesh bordering Tibet to the east. It has three high mountain ranges, namely [Zanskar](#) and the [Himalayas](#), that enclose the valleys of [Baspa](#), [Satluj](#), and [Spiti](#), as well as their tributaries. The slopes are covered with thick wood, orchards, fields, and hamlets. At the peak of [Kinnaur Kailash](#) mountain is a natural rock Shivling (Shiva [lingam](#)). The district was opened to outsiders in 1989. The old [Hindustan-Tibet Road](#) passes through the Kinnaur valley along the bank of river [Sutlej](#) and finally enters Tibet at [Shipki La](#) pass. Kinnaur is the second richest district in terms of per capita income after [Solun](#) in Himachal Pradesh.

Methodology used: Quantitative Analysis, Cross Sectional Survey

To conduct the study, data was collected from 369 personnels with Engineering personnel out of 869 personnel from selected five Units, who have undergone e-Training programs. The information is collected on the e-Training programs for personnel conducted during the year 2020-21. The selected power plants in Kullu and Kinnaur Districts, Himachal Pradesh India are in hilly and remote areas and far-flung places from main cities. The personnels working for Power Plants both in Engineering cadres with technical and non-technical trades have attended various e-Training programs on Technical and Non-Technical e-Training programs on “Technical: Hydro Power/Solar Power/Wind Power/ Renewable Energy/IT, Non-technical: Functional/ Yoga, Health & Lifestyle”. Due to pandemic, traditional training methods were not possible, which were also expensive. The selected power plants adapted e-Training methods. These programs have surely enhanced knowledge and resilience levels of all the Engineering personnels across power plant. Senior Management, Management, Executives/Non-Executives both in technical and non-technical trades and women personnel benefited and families of personnel working in these plants were attended programs on Yoga, Lifestyle Management and got tremendous benefits.

In all it is observed that enhancement of determination, vision, interaction, relationships, organizing, self-confidence, pro-activeness and soft skills like social inter-personal skills, flexibility, empathy, positive attitudes, responsibility, initiative taking, teamwork have tremendously improved in personnels. It is also observed that the agility and resilience levels enhanced are based on personnel’s educational backgrounds, experience levels. With enhanced agility and resilience levels in personnels results that they are willing and ready to face any challenges. They have shown positive approach treating the problem as opportunity instead of threat. With this attitude personnels have easily thrived in pandemic and adapted latest technology.

Measurement of Constructs

The PLS3-SEM method is used in this study. The application of this approach necessitates determining whether the latent variable is formative or reflective (Samantaray et al 2023). The latent variables are not inherently formative or reflective; this is dependent on the method of analysis. The constructs are being measured. The main

difference between measuring reflective and formative constructs is that the reflective construct causes variations in its indicators, whereas the formative construct causes variations in its indicators; thus, the direction of causality in formative constructs is completely reversed in reflective constructs. The reflective variable is a latent variable that exists independently of its indicators' effects and is the source of its observed measures. When an indicator is removed, the correlation between the remaining indicators and the latent variable remains unchanged (indicator interchangeability effects) (Simonetto 2012). However, the formative variable is a latent variable that is determined by its indicators and is a function of its observed measures (Edwards and Bagozzi 2000). Each observed indicator in formative models describes a different aspect of the latent construct. Thus, removing one or more Bollen, 2007 observed measures from the formative construct results in the removal of a specific part of the construct (Wilcox et al. 2008).

8 Conceptual Framework

Personnel with Engineering cadres having technical backgrounds, when enter any organization initially they don't have capabilities to face any crisis and competencies due to various reasons in the business markets. They cannot be able to adapt instantly technological changes and perform in a balanced manner. When they are provided e-training on agility, technical updates and skills by their team leaders, they can easily thrive crisis successfully with enhanced confidence. Developed personnel agility levels through e-Training depend on their qualifications and experience. Personnels upon training capable to thrive various situations with imbibed agility through e-training programs and achieve success for the organizations.

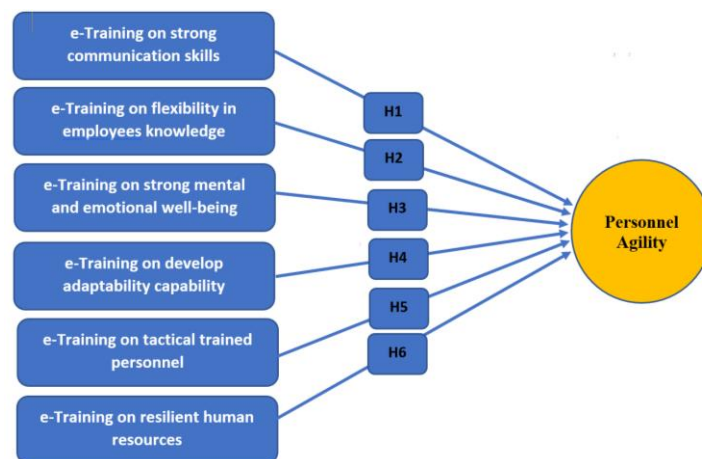


Figure: Conceptual framework

Above conceptual framework indicates organizations using e-Training makes impact on personnel agility with Engineering cadres. Significant development in Engineering personnel's agility after attending e-Training noticed.

The model we selected contained 16 latent variables and every variable was measured through structured questionnaires, just like the first latent variable was e-Training, Personnel Agility.

Hypothesis of the study are:

H1: e-Training on strong communication skills has significant and positive impact on Engineering Personnel's Agility.

H2: e-Training on flexibility in employee's knowledge has significant and positive impact on Engineering Personnel's Agility.

H3: e-Training on strong mental and emotional wellbeing has significant and positive impact on Engineering Personnel's Agility.

H4: e-Training on developing adaptability capability has significant and positive impact on Engineering Personnel's Agility.

H5: e-Training on planned training personnel has significant and positive impact on Engineering Personnels Agility.

H6: e-Training on resilient human resources has significant and positive impact on Engineering Personnel’s Agility.

Measurement model result assessment

The purpose of reliability testing is to evaluate the material's internal consistency. Cronbach's Alpha is a well-known dependability metric. Taber (2016) defines a good reliability test value as greater than 0.7. Meanwhile, Hair et al. 2019; Crandall et al., 2011 defined reliability as a composite dependability score in excess of 0.6. According to Table 4, all of the things were reliable and met the scholar's value. Hair et al. (2019) proposed setting the factor loading criterion between 0.5 and 0.7. All of the loading factors were more than 0.5. Furthermore, the average variance extracted (AVE) is defined as the aggregate weighted mean of such construct-related components' squared loadings, and it is a standard metric for testing convergent validity. When the AVE is 0.5 or greater it suggests the construct explains more than half of its component variation (Hair et al.2019).

Table: 1 Variables, Indicators & Factor Loadings

Variables	Indicators	Factor Loading
e-Training on strong communication skills (SCS)	SCS1 - E-training programs that provide training in technical writing.	0.783
	SCS2 - E-training programs that provide training in presentation skills.	0.844
	SCS3 - E-training programs that focus on collaboration skills.	0.952
	SCS4 - E-training programs that focus on interpersonal skills.	0.772
	SCS5 - E-training programs that provide training in conflict resolution.	0.725
	SCS6 - E-training programs that focus on active listening.	0.973
e-Training on flexibility in employee’s knowledge (FEK)	FEK1 - E-training that covers a broad range of skills and knowledge can help employees to be more flexible in their approach to problem-solving and adapt to changes in their work environment.	0.913
	FEK2 – E-training on Encouraging employees to engage in continuous learning and providing opportunities for ongoing programmes	0.862
	FEK3 - E-training programs that provide cross-functional training	0.909
	FEK4 - E-training programs that provide technology training	0.737
	FEK5 - E-training programs that provide industry-specific training	0.858
	FEK6 - E-training programs that focus on professional development	0.961
e-Training on strong mental and emotional well-being (SME)	SME1 - E-training programs that promote work-life balance	0.783
	SME2 - E-training programs that focus on team building	0.819

	SME3 - E-training programs that focus on building resilience SME4 - E-training programs that focus on mindfulness SME5 - E-training programs that promote positive psychology	0.952 0.772 0.885
e-Training on develop adaptability capability (DAC)	DAC1 - E-training programs that provide technical training in different areas of engineering DAC2 - E-training programs that offer cross-functional training DAC3 - E-training programs that provide risk management DAC4 - E-training programs that focus on the ability to analyse complex problems and develop creative solutions. DAC5 - E-training programs that offer cross-functional training	0.771 0.829 0.901 0.972 0.795
e-Training on planned/tactical trained personnel (TTP)	TTP1 - E-training programs that provide technical training in the latest engineering technologies and practices TTP2 - E-training programs that focus on safety training TTP3 - E-training programs that focus on project management TTP4 - E-training programs that provide troubleshooting skills TTP5 - E-training programs that provide security training TTP6 - E-training programs that focus on customer service TTP7 - E-training programs that provide time management	0.783 0.844 0.952 0.772 0.885 0.973 0.936
e-Training on resilient human resources (RHR)	RHR1 - E-training programs that focus on stress management RHR2 - E-training programs that focus on emotional intelligence RHR3 - E-training programs that focus on adaptability RHR4 - E-training programs that focus on self-reflection RHR5 - E-training programs that teach mindfulness RHR6 - E-training programs that provide employees with problem-solving skills	0.828 0.865 0.937 0.783 0.860 0.937
Personnel Agility	PA1 – Enhanced communication skills PA2 – Flexibility in technical Knowledge PA3 – Emotional well-being and balancing PA4 – Adaptability PA5 – Tactically trained personnel PA6 – Resilient human resources	0.987 0.867 0.914 0.929 0.945 0.907

Table 2: e-Training & Personnel Agility constructs/indicator

Construct	Indicators	References
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e-Training on strong communication skills (SCS)	<p>SCS1 - E-training programs that provide training in technical writing.</p> <p>SCS2 - E-training programs that provide training in presentation skills.</p> <p>SCS3 - E-training programs that focus on collaboration skills.</p> <p>SCS4 - E-training programs that focus on interpersonal skills.</p> <p>SCS5 - E-training programs that provide training in conflict resolution.</p> <p>SCS6 - E-training programs that focus on active listening.</p>	<p>Driscoll and Reid (1999)</p> <p>Kajiyama et al (2013)</p> <p>Östlund (2017)</p> <p>Rathee and Renu (2018)</p> <p>Echard & Berge (2008)</p> <p>Thomas Gordon (1975).</p>
e-Training on flexibility in employee's knowledge (FEK)	<p>FEK1 - E-training that covers a broad range of skills and knowledge can help employees to be more flexible in their approach to problem-solving and adapt to changes in their work environment.</p> <p>FEK2 – E-training on Encouraging employees to engage in continuous learning and providing opportunities for ongoing programmes</p> <p>FEK3 - E-training programs that provide cross-functional training</p> <p>FEK4 - E-training programs that provide technology training</p> <p>FEK5 - E-training programs that provide industry-specific training</p> <p>FEK6 - E-training programs that focus on professional development</p>	<p>Bondar et al (2020)</p> <p>Gabelaia & Bucovetchi (2020).</p> <p>Abreu & Alcântara (2015)</p> <p>Park et al (2019)</p> <p>Percival and Percival (2008).</p> <p>Mohsin and Sulaiman (2013)</p>
e-Training on strong mental and emotional well-being (SME)	<p>SME1 - E-training programs that promote work-life balance</p> <p>SME2 - E-training programs that focus on team building</p> <p>SME3 - E-training programs that focus on building resilience</p> <p>SME4 - E-training programs that focus on mindfulness</p> <p>SME5 - E-training programs that promote positive psychology</p>	<p>Wiradendi et al (2020).</p> <p>De Santo & De Meo (2016).</p> <p>Samantaray et al (2023)</p> <p>Miyamoto (2021)</p> <p>Wiradendi et al (2020).</p>
e-Training on develop adaptability capability (DAC)	<p>DAC1 - E-training programs that provide technical training in different areas of engineering</p> <p>DAC2 - E-training programs that offer cross-functional training</p> <p>DAC3 - E-training programs that provide risk management</p> <p>DAC4 - E-training programs that focus on the ability to analyse complex problems and develop creative solutions.</p> <p>DAC5 - E-training programs that offer cross-functional training</p>	<p>Christian et al (2007).</p> <p>Abreu & Alcântara (2015)</p> <p>Al-Hila et al (2017).</p> <p>Liao & Ho (2008).</p> <p>Abreu & Alcântara (2015)</p>
e-Training on tactical trained personnel (TTP)	<p>TTP1 - E-training programs that provide technical training in the latest engineering technologies and practices</p> <p>TTP2 - E-training programs that focus on safety training</p>	<p>Park et al (2019)</p> <p>van Wyk & de Villiers (2016)</p>

	TTP3 - E-training programs that focus on project management TTP4 - E-training programs that provide troubleshooting skills TTP5 - E-training programs that provide security training TTP6 - E-training programs that focus on customer service TTP7 - E-training programs that provide time management	Wijakkanalan et al (2013). Kasprisin et al (2003) Al-Hila et al (2017). Findıklı & Bayarçelik (2015)
e-Training on resilient human resources (RHR)	RHR1 - E-training programs that focus on stress management RHR2 - E-training programs that focus on emotional intelligence RHR3 - E-training programs that focus on adaptability RHR4 - E-training programs that focus on self-reflection RHR5 - E-training programs that teach mindfulness RHR6 - E-training programs that provide employees with problem-solving skills	Kumar and Kumar (2022). Khosla et al (2009). Paraskevas et al (2015). Andrade (2015). Miyamoto (2021) Wijakkanalan et al (2013). Liao, S. H., & Ho, Y. P. (2008).
Personnel Agility	PA1 – Enhanced communication skills PA2 – Flexibility in technical Knowledge PA3 – Emotional well-being and balancing PA4 – Adaptability PA5 – Tactically trained personnel PA6 – Resilient human resources	Hussain (2019). Knot et al (2001). Wolff et al (2013). Paraskevas et al (2015). Crichton & Rattray (2000). Wang et al (2014).

Table 3. Confirmatory factor analysis with Cronbach Alpha, Composite Reliability (CR) and Average Variance Extracted (AVE):

Main construct	Cronbach alpha	CR	AVE
e-Training on strong communication skills (SCS)	0.943	0.962	0.622
e-Training on flexibility in employee’s knowledge (FEK)	0.895	0.920	0.641
e-Training on strong mental and emotional well-being (SME)	0.864	0.892	0.658
e-Training on develop adaptability capability (DAC)	0.928	0.947	0.578
e-Training on tactical trained personnel (TTP)	0.920	0.955	0.663

e-Training on resilient human resources (RHR)	0.877	0.901	0.589
Personnel Agility (PA)	0.786	0.857	0.633

Table 4 Discriminant Reliability

The Fornell-Larcker criterion was used to verify and confirm discriminant validity by assessing the extent to which each latent variable was distinct from other constructs (Chin 2010; Hair et al. 2017). Table 3 displays the results of this criterion.

Fornell-Larcker Criterion

	SCS	FEK	SME	DAC	TTP	RHR	PA
SCS	0.859						
FEK	0.430	0.832					
SME	0.325	0.262	0.789				
DAC	0.422	0.254	0.256	0.699			
TTP	0.258	0.455	0.310	0.326	0.800		
RHR	0.231	0.290	0.296	0.299	0.322	0.714	
PA	0.247	0.320	0.315	0.316	0.258	0.401	0.766

Table: 5 The Heterotrait-Monotrait Ratio (HTMT)

	SCS	FEK	SME	DAC	TTP	RHR	PA
SCS	1.000						
FEK	0.677	1.000					
SME	0.352	0.753	1.000				
DAC	0.128	0.279	0.579	1.000			
TTP	0.232	0.027	0.316	0.600	1.000		
RHR	0.317	0.164	0.122	0.371	0.538	1.000	
PA	0.158	0.377	0.351	0.411	0.166	0.255	1.000

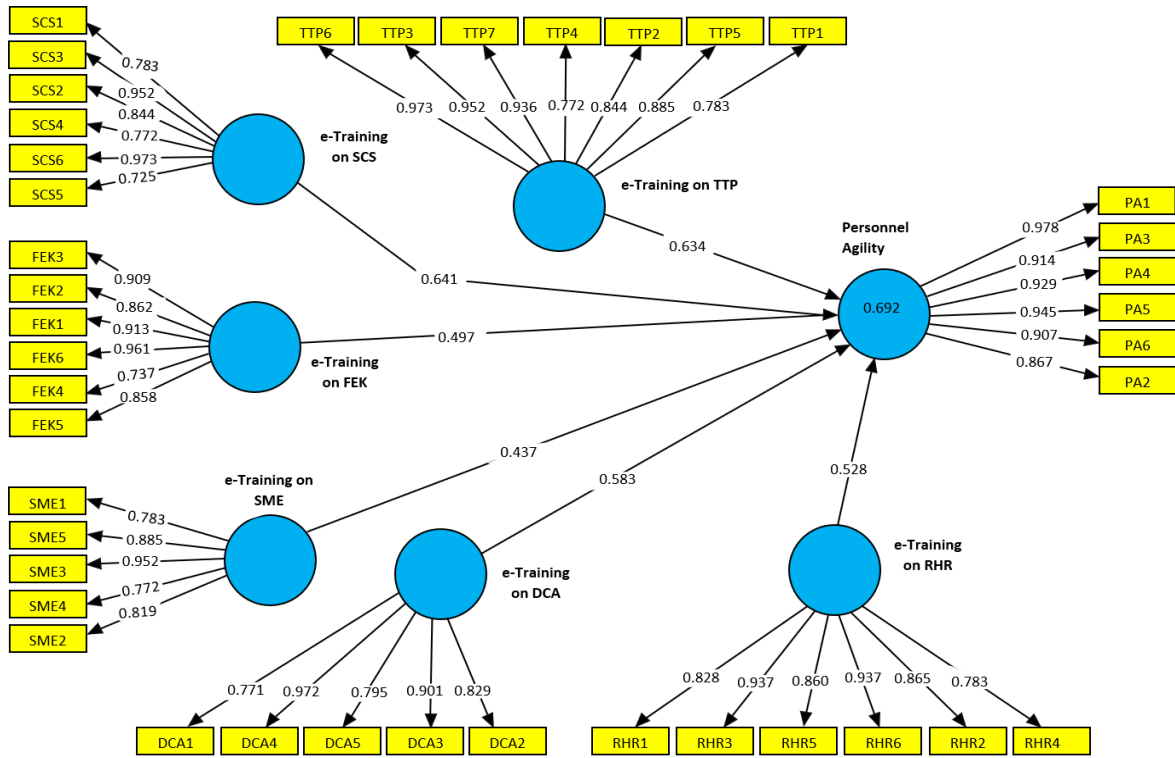


Fig.4 PLS-SEM data analysis

Testing of hypothesis

Hair et al. (2017) proposed evaluating the structural model by looking at the R², beta (β), and corresponding t-values using a bootstrapping procedure with a resample of 5,000. They also suggested that, in addition to these basic measures, researchers report predictive relevance (Q²) and effect sizes (f²).

Table:6 Path-coefficient

Hypothesis Relationship	Path-coefficients
H1 = SCS ≥ PA	0.641
H2 = FEK ≥ PA	0.497
H3 = SME ≥ PA	0.437
H4 = DAC ≥ PA	0.583
H5 = TTP ≥ PA	0.634
H6 = RHR ≥ PA	0.528

Table:7 Results of the hypothesis testing

Hypothesis Relationship	Std.β	Std. Error	t-value	Decision	p-value	R ²	Q ²	F ²
H1 = SCS ≥ PA	0.631	0.024	9.752	Supported	0.000	0.692	0.577	0.237
H2 = FEK ≥ PA	0.574	0.047	7.148	Supported	0.000			0.475
H3 = SME ≥ PA	0.378	0.019	12.162	Supported	0.000			0.433

H4 = DAC \geq PA	0.590	0.043	9.114	Supported	0.000		0.321
H5 = TTP \geq PA	0.573	0.062	10.623	Supported	0.000		0.382
H6 = RHR \geq PA	0.628	0.032	14.734	Supported	0.000		0.528

Results and Discussion

The findings of the study reveal that e-Training technology develops Engineering personnel agility with technical backgrounds. It results in adapting technological changes continuously. The findings of the study also reveal that qualification of Engineering cadres personnels is an important factor that affect the performance of personnels in hydroelectric sector. The e-Training can be delivered through various formats such as e-training classes, webinars, e-workshops, virtual training. These training programs can cover a range of topics, including the benefits and challenges of modern technologies, the use and maintenance of hydroelectric machinery, the use of precision technologies.

In total 369 personnels with Engineering backgrounds of selected plants in Kullu and Kinnaur Districts of Himachal Pradesh India were undergone e-Training programs during the Financial Year 2020-21 apart from non-technical personnel. The e-Training programs were organized for Executives/Non-executives in technical and non-technical branches. In total 30 e-Training programs were organized in 60 different sessions (Table 1). Since lockdown and pandemic period, Training & HR Divisions of selected Hydroelectric Power Units had conducted various short-term e-training programs, webinars, e-workshops/ conferences through electronic method. HR Divisions played an important role in nominating, motivating personnels for optimum participation, communicated personnels to encourage family members to participate in Yoga, Health & Lifestyle programs arranged for them. Personnels who were working in offices and working from their homes participated in great number.

During 2020-21, Training & HR Division of Karcham Wangtoo, Door Sanchar, Kanchan Junga, Aleo-I and Aleo-II Power Stations had made its great efforts to conduct short-term training programs, webinars, e-workshops/conferences through e-Training method. The e-Trainings through Webinars and e-workshops for personnels were conducted in technical knowhow and on solar/wind/hydro power. Training & HR Division had been organizing programs through digital methods as well by conveying personnels for adhering to social distance and other norms during a pandemic. Personnels who were working in offices and working from their homes participated in great numbers. As a result, participants have attended the short-term training programs, webinars, and online-workshops through online methods on topics related to technical.

HR Division with the coordination of the IT Division had conducted these programs in an effective manner. All the Senior and Middle-level Executives in Engineering & Non-Engineering technical fields of Hydroelectric Power Units expressed gratitude for providing such a wonderful opportunity to participate in the Webinars, which has enhanced their skills, knowledge, information, techniques, during a pandemic situation in the year 2020-21. The disruption situations in business world are not going to disappear. As technology develops faster and the world becomes more and more a global marketplace, there is no place to hide. Change is relentless and the landscape in which we work is constantly shifting. Seen from this point of view disruption situation becomes an opportunity for development and greater collaboration, rather than a risk to be mitigated. The personnels with high skills, technical knowledge and intrinsically motivated exhibits adaptive nature, problem solving ability, innovative attitude, flexible team spirit for the organization and also personnels at individual levels, team levels become capable to face disruptive situations.

Limitation & Implication of Study

There is limited research on enhancing agility in Engineering personnels working for hydroelectric power sectors in Himachal Pradesh. Personnel Agility and flexibility to adapt latest technology has enhanced through imparting e-Training on technical skills and soft skills, which results in handling with confidence during turbulence situations. The current study will expand the knowledge on the subject. The present study reveals that if the personnel is imparted with e-Trainings on technical subjects, the personnel surely

improve technical knowledge and perform in a balanced and effective manner with flexibility to adapt to technical changes during disruptive situations. The present study will surely help in understanding that formulating effective e-Training subjects and team work by team leaders and organization, results in successfully thriving disruptive situations and sustained organizational growth. All Organizations which are not yet adapted e-Training methods to enhance the knowledge of Engineering personnels need to impart training to keep them balanced performance during disruptive situations. This research is limited to five selected Units of Kullu and Kinnaur districts located in Himachal Pradesh of India.

Conclusion

This study would contribute to the detailed understanding of Engineering personnels' technical agility, flexibility to adapt technology in acquiring skills through e-Training programs in hydroelectric power sector in Himachal Pradesh. To know how they have faced challenges and thrived through crisis situations. Study shown that upon acquiring agility through e-Training they have contributed a lot for their organizational sustained growth. The organizations are very clear about continuous e-Training and development activities. The online platform provided opportunities for trainers and trainees to interact and share their knowledge. The organization used e-Training methods and very few in traditional method, web-based learning, and Training platforms to equip their personnel in changing environments. The electronic-Training is emerging as a candid alternate to conventional methods of training. The e-Training as a cost-effective, flexible, and wider access method is providing an edge to modern organization.

Conflicts of Interest

“The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.”

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