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Wearable Technology: A Stimulant for Employee Engagement in a Hybrid Work model

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Abstract: Wearable technology is an innovative concept that has been widely developed across the world. It is often referred as "Wearable devices" or "Wearables" which can be worn by the individuals in their body with a motive to assist the day-to-day activities, thus providing sophisticated digital experience to the users. The objective of the study is to showcase the role of wearable technology in inducing employee engagement specifically in a Hybrid work environment. The reason for attempting the study in Hybrid work environment is that the new transition of work model to Hybrid confronts significantly more challenges in engaging the workforce. Therefore, the study promises to find out the various wearable devices used in the workplace to foster employee engagement and its relative consequences. The study is conceptual in nature that emphasizes and exposes the theoretical background and related concepts of wearable technology and hybrid work employee engagement. The previous researches have explored the concept of wearable technology and its applications in traditional work setup. Whereas, this study extends its novelty by examining the role of wearable technology in Hybrid work model in enhancing employee engagement. The study findings reveal various conceivable wearables that can be assimilated in the workplace. From the study it has been suggested that the organization should introduce wearable technology to their workforce to potentially increase workers engagement and performance in both on-premise and off-premise work environment.

Keywords: *Wearable technology, Wearables, Wearable devices, Employee engagement, Hybrid model, Digital work place, IoT.*

1. Introduction

Wearables are the gadgets that can be worn or embedded in the body which facilitates and support users' routine tasks and commitments. To be more specific, these wearables were used in the corporate to assist and monitor employees' task and performance [1]. Not restricted to the corporate, these wearable devices were also incorporated in various sectors like Hospitals, transportation, fitness, police administration, military and defence, digitized textiles, digital forensic, networking, navigation, cyberspace etc. Thus, this significant growth of wearable technology is ample to prove and recognize it as supreme edge of the "Internet of things (IoT)".

Wearable devices in general are smart devices with embedded microcontrollers, sensors and application software, that can be worn on the user's body which tracks, detects and transforms information through input signals and data and provides required feedback to the users or "wearers". Another interesting concern of these wearables were, it can be paired up or connected with other available devices like PC, Phones, Laptops, home appliances and other portable and Bluetooth devices respectively [2].

Some of the most common wearable devices available for day-to-day use were: Smart watches, fitness band, hearing aid, wearable cameras, Bluetooth smart microphone, smart cloth, smart fabric, smart ring, smart shoes, smart underwear, Patient sensors, Smart google glasses, smart biometric data monitoring, Smart cap, smart contact lenses etc. [3]-[4].

1.1. Definition

There is no precise scholarly definition for "Wearable technology", rather than there are relative meanings that describes wearable technology. The substitutable terms for wearable technology are "Wearable devices", "Wearables", "Wearable gadgets" and "Wearable electronics". [5] defined wearable technology as "an application-enabled computing device which accepts and processes inputs". This device is generally a fashion accessory usually worn or attached to the body [6]. "The device could work independently or be tethered to a smartphone allowing some kind of meaningful interaction with the user. The wearable product could be on the body (like a smart patch), around the body (like a wristwatch or a headband) or in the body like an identification sensor embedded under the skin or a sensor attached to the heart monitoring cardiac aberrations" in the words of [7]. Wearable gadgets are designed such a way that offers uniqueness and customised feature to the users [8]-[9]. The significant characteristic nature of wearable devices is that they are hands-free in nature, says [10]. In the words of [11], wearable devices convey information and they are easily accessible, robust and wearable. Wearable gadgets are designed such a way that offers uniqueness and customised feature to the users [8]. Wearable devices enable employee's participation and interaction in the work place. Also, several wearables feed data and provide information about the work environment and employees' performance in the workplace [8].

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1.2. History and Evolution

Wearable technology has got its root in the year 1500, where Peter Henlein an inventor from German have invented a “smart watch” which can worn around the neck like a necklace. The first “Smart hearing aid” was invented in the year 1800 that helps in amplifying the sound. “Calculator watches” came into existence in the year 1970s. Early 2000s has led to the rise of “Wearable cameras” which used for sousveillance (“An activity of tracking the happenings by the participant in the event”). Inbuilt microphone in a pair of earrings have been invented by Ilya Fridman in the 2008. Quantified self-movement started in the year 2010 that led to the evolution of Fitness bands that monitors and tracks the step counts of the users. “Smart ring” was invented by Joseph Prencipe in 2012 which is used for digital transfer with the advantage of pairing with other devices. **[Source, Courtesy: Wearable_technology, Wikipedia.org]**

2. Objectives of the study

The main focus of this paper is to study and understand the wearable technology and its applications in the work environment. The paper also portrays the history and evolution of wearable technology. The present study aims to analyze various wearable devices that can be used in the work place to stimulate employee engagement and productivity especially in Hybrid work environment. The study also discusses the framework of wearable technology in the work ecosystem.

3. Methodology of the study

The study is conceptual in nature and it involves in depth analysis of scholarly reviews of conceptual and empirical research papers on wearable technology and its applications. For the purpose of the study data were collected from online research databases such as Google scholar, ProQuest, Scopus database, Emerald management books, EBSCO and Elsevier databases. Around 25 research articles were reviewed for literature analyzes. Keywords used to search on this concept of this present study were wearable technology, Internet of things, Wearable devices, Quantified work place and Smart work place.

4. Review of Literature

[12] have identified 23 types of wearable gadgets and its potential benefits and challenges of wearable technology. In this study, it was mentioned that wearables increase work efficiency, physical and mental well-being and it also considerably reduces the workplace injuries and accidents. The study portrays that wearable technology has several pitfalls like technical issues, socio-economic issues and policy issues. The research suggests that the management should take necessary steps to overcome the challenges associated with implementation of wearable technology.

[13] have studied the intention of usage of sports wearables by the individuals based on theory of acceptance and technology framework. The study findings reveals that the variable technophobia moderates the relationship between the independent variables namely "performance expectancy, effort expectancy, social influence and facilitation conditions" and dependent variable namely the intention of the individual to use the wearable device. Thus, it is evident from the study that individuals’ psychological constructs play a key role in the usage of wearable devices.

[14] have discussed the benefits, challenges and ethical considerations involved in the usage of wearable devices in the workplace. The study findings insists that wearable devices increase employee’s productivity which also includes the potential risk of security issues associated with it. The study recommends that employee’s active engagement and security and privacy concerns should be given priority for effective implementation of wearable technology in the work place.

[15]**,** have analyzed the public opinions on wearable cameras and google glass in this paper. From the study it was found that the public shows positive attitude towards wearable cameras and google glass and also hold affirmative assumptions towards the benefactory of technological advancement.

[16] have examined the role of self-tracking technology in the work place in regulating human behaviour and interaction. The study states that privacy and ethical concerns should be considered while planning to quantify the workplace using wearable technology. The study discusses that the wearable technology will help in evaluating others performances and data collection and sharing. Relatively there is also high risk of security, privacy, moral and control issues with regards to wearable technology.

[17] have conducted research in four different countries to examine the technological factors adoption in the context of care-givers. Dual factor theory was applied in this research to study the behavioural intention of the respondents towards usage of technology. The study reveals that usage of wearable technology by the care-givers considerably increases their service operation.

[18] have reviewed the potential applications of wearable devices technology in this paper. The study portrays various significant benefits of wearable technology which includes increase in productivity, work satisfaction, time saving, improved communication, retrieval of information, improved work place experience and operational efficiency. The study also recommends the management to address the risks associated with privacy, data control and data ownership in the view of implementing wearable technology in the work place.

[19] in this paper have focused to study the various issues underlying in the implementation of wearable devices in the work environment. From the study it was evident that wearable technology has various pitfalls like data protection, data control, privacy issues, ethical issues, legal issues and obsessive behaviour of the employees. The study suggests the management to take initiatives to regulate the employee behaviour and to address the prospective issues in the usage of wearable technology.

[20] have investigated the influence of information and communication technology on Human resources specifically in hospitality and tourism industry. The study confirms that the contribution of information and communication technology is substantial in all the functions of Human resource management like recruitment, selection, employee data collection, knowledge management, training and development, content and diversification management, performance evaluation, employee engagement and various other functions.

[21] have conducted this research in health insurance companies to study how the wearable technology can be integrated with big data analytics for the formulation of business strategy. The study reveals that wearable technology influences the company's

business strategy by improving product innovation, service quality, knowledge management, strategic intent and competitive advantage. It is also evident that wearable technology facilitates the big data analytics in the business processes of the health insurance firms.

[22] have discussed the safety technologies adopted in the work place in the context of construction industry. The study insists that adopting safety technology in the work environment will considerably reduce work place hazards and accidents that too specifically in the construction industry. The study suggests the companies to include wearable technology in the work place to alleviate hazards and to ensure safety of the employees.

5. Wearables in HRM

Wearable devices are gaining importance and being widely incorporated in Human resource ecosystem. With the help of wearable devices, the employers can monitor the employees, track the employee's health [23] – [24], provide them a better experience and wearables also helps in ensuring employee health and safety, assist the employees in their routine tasks, helps employees in managing their time, increases their engagement towards work and ensures workplace wellness [25] – [26].

Previously, collecting and managing the data concerning employees was a tedious task. Whereas, now with the usage of wearables integrated with HR application software, these monotonous tasks can be accomplished effectively as a result increasing the work efficiency and productivity.

Research conducted by "Human cloud at work" states that, when the employees were provided with wearables, there was a considerable increase in job productivity (by 8.5%) and job satisfaction (by 3.5%).

6. Employee engagement in Hybrid work environment

6.1 Employee engagement

Employee engagement is the emotional commitment [27] or bond that an employee holds towards their job or organization. Dr. William Kahn**,** the father of employee engagement concept has defined employee engagement as "the harnessing of organization members' selves to their work roles; in engagement, people employ and express themselves physically, cognitively, and emotionally during role performances"[28].

6.2 Hybrid work environment

Hybrid work model is the combination where the employers allow some of the employees to work from home and allow some percentage of the employees to work from the office. It is typical blend of managing two types of workforces, that is work force operating on-premise and work force operating remotely. In other words, a part of the workforce is permitted to work in the office and the other part were given flexible to work from anywhere.

6.3 Employee engagement and Hybrid work setup

Managing the employees in a Hybrid model is quite challenging since the work force is physically dispersed. And due to lack of direct supervision, the managers find it difficult to actively engage their employees towards the work. The management also find it tough to coordinate the two extent (On-premise and off-premise) workforces and to synchronize communication between them.

To summarize, the main issue that the organization is facing while transitioning to hybrid model is gaining employee engagement. There are various strategies to engage the workforce. Particularly, when concerned with Hybrid model workforce, it seems that traditional employee engagement strategies are not that much fruitful and effective. As the technology plays a significant role in achieving work effectiveness in Hybrid model, the optimal way to engage employees can be obtained through the inclusion of technological advancements.

From the scholarly research and reviews, it was inspected that the one way to enhance employee engagement is by equipping wearable technology to the employees in the workplace.

7. Various wearable devices that can be equipped in the workplace

Let us look onto (Table 1) the various available wearable devices with its applications, which can be provided to the employees to enhance their workplace engagement level especially in adapting Hybrid working model.

Table 1. Wearable devices with its applications

Wearables	***Observation***	***Applications***
Senso track ear sensor	Oxygen saturation level, heart rate	Ensures occupational health & safety and monitors physiological signs.
Google contact lens	Tracks body fluids, glucose level	Useful for the employees with visual impairment
Smart watch	Tracks activity, monitors heart and pulse rate.	Used to answer phone calls, take pictures, track fitness, sleep etc.
Smart ring	Tracks activity, Provides reminders, monitors heart and pulse rate.	The function of smart watch is replaced in a ring.
Qardio care	Oxygen saturation level, heart rate, Electro-encephalogram (ECG) monitor.	Tracks complete heart health through smart devices
Vital jacket	Cardio pulmonary parameters - ECG, saturation level, abdominal and chest status.	Monitor vital signs, diagnostic technology, health monitoring.
Chest straps	Heart signal	Fitness and medical health
Adhesive patches	Heart signal	Fitness and medical health
Smart t-shirt	Heart signal	Temperature, heart rate and respiration
Fit shirt, H wear, N ECG textile, Vital jacket, Smartex wearable wellness system	ECG monitoring, actigraphy trackers, internal storage, wireless communication	To understand human heart behaviour, physiological state like stress and fatigue and also shuffles play list.
Lobin	Bio monitoring, ECG, body temperature, heart rate, activity index, patient location, angle of inclination	Monitors several patients at the same time irrespective of the dispersed location using graphical user interface
Smart phone and wrist	Fitness monitor, tracks	Used as a check in

bands	sleep, motion sensor, skin sensor.	tool and emergency button for lone workers and performance tracker. It will alert the employees if they misplace a product in a wrong place or in a wrong stock bin
Id badge	Photo ID, Card serial number.	Specifically designed for social workers to contact in case of emergency, can pay for meals, Employees can check in and check out to their cabins.
Smart glasses	Head motion and voice tracking.	Used for video conference, captures photos and videos, Provides augmented reality experience.
Smart headphones	Track voice, response to voice commands.	Prevents the external environmental noise,
Sleepbuds	Sense external noise and does noise masking.	Used to fall asleep faster and also for alarm purpose.
Wearable scanner	Scan the barcodes and radio frequency identification.	Specially designed for mobile employees to pick up and scan the products using barcodes especially in the warehouse
Industrial IoT sensor	Sound frequency, temperature and vibrations	Analyse whether the machine is working in normal condition or not alerts in case of critical incidents

8. Wearable devices and Employee engagement

Debra Wasserman**,** is a Director of HR Service delivery in Transunion, an US based Company. In 2015, in her research about employees' wellness plan and programs found that employees' wellness does not depend on just physical health of the employees, it also considers their emotional health and financial health. Thus, from this research it is evident that employees' health is a primary factor that has to be seriously concerned for their active participation and engagement in the work. Therefore, employee health is an integrated sum of emotional health, physical health and spiritual health.

Wearable devices primarily focus on tracking physical health of the employees [29] with extended application of monitoring their work-related data. From this aspect, it can be arrived to the conclusion that healthy employee is actively engaged in their work and are highly productive. Wearables are one of the strongest stimulators of employee engagement, they assist the employees by reducing their job boredom, workload and maximizes the optimization in the work.

Wearables such as smart watches, wrist bands, smart glasses, smart rings, industrial IoT sensors, Id badge, smart tex, smart scanners, smart jacket and smart headphones were meant for its contribution in collecting, managing and providing data and information to the employees needed for their job and assist them in work environment ensuring efficiency, effectiveness, health and safety. These gadget plays a considerate role of an expert system and helps employees in problem solving and complex decision making.

And also, to make it more sensible, when employees have been provided with needed job resources in terms of technology, support systems, devices and gadgets which can be collectively termed as "Wearable devices", they could exhibit high level of engagement in their work and also could attain optimization and process improvement.

9. Framework of Wearable technology in work ecosystem

The framework of Wearable technology in the work ecosystem is described in the Fig 1. It has been illustrated that wearable devices were designed with inbuilt data repository where it collects and stores various data through processor and sensors in a cloud design technology, that enables the wearables to connect with various devices. Data is then processed to provide necessary information to the users. For instance, when the device like smart watch or fitness band monitors the heart rate using ECG signals and sensors, it collects the data and process it and provide oxygen level (SpO2) of the user.

The processed information is stored for the future use and compressed into knowledge repository serving the domain wise information. This knowledge repository will be a part of expert system in providing related knowledge to the users. In the work setting, an employee can make use of expert system through the knowledge repository and could gain knowledge to support their jobs and tasks. By providing necessary expertise knowledge, resources and tools the employees will be highly engaged in their work thus adding more value and meaning to their job.

The underlying framework states that the employee engagement leads to the following outcomes at the three levels namely: Individual level, group level and organizational level. At the individual level wearable devices will enhance knowledge, skill and ability of the employees, and at the group level it increases job efficiency and team effectiveness, at the overall organizational level wearable devices will be the promising reason for the improvement in organizational performance, organizational effectiveness and overall value of the organization.

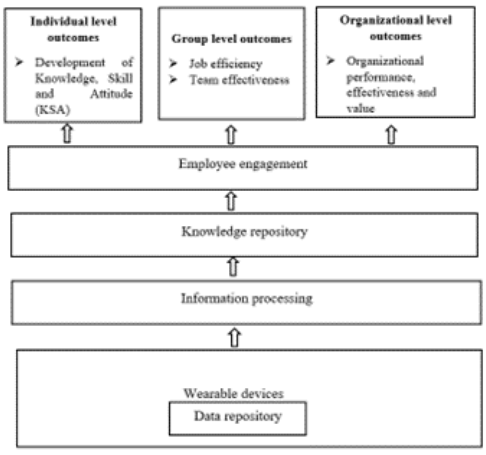

Figure 1. Framework of Wearable technology in work ecosystem.
Source: The authors (based on literature review)

10. Challenges of Wearable technology

Apart from the significant advantages of wearable devices, there is also a considerable disadvantage which is discussed below: There are technical and technological issues associated with the wearable devices like low battery and compatibility issues, low

reliability and validity of collected data. Since, the data is collected and shared in an online and cloud platform there is a risk for security and privacy of the data. Potentially, some of the wearable devices are of higher cost in the market and people are less affordable to own it. Another, significant pitfall of these wearables is that, there may be a chance for skin diseases and allergies when is worn by the user on their skin or body.

On the other aspect, psychologically when the users are exposed to more data on their health, there is a possibility for the individual to be more obsessed, stressed and over conscious in their daily routine that may lead to mental and physical disorders in a relative period of time.

11. Discussion

Wearable technology is one of the prominent advancements in the digital era. It has shown its widespread applications in the Human resources domain and in the work place. Wearable technology has been considered as a powerful tool in Human resources as it ensures health, safety and employee well-being in the workplace. This paper discusses that there are various wearable devices exclusively designed to meet the requirements of the Human resources activities and supports employees in their work. As discussed earlier, the employers and employees can use these wearable devices to get assisted in their job, to be more engaged in their work. The study also points that, in a transition from fully on-premise work model to Hybrid model, there is a considerable need for motivating employees to keep them focused and engaged in their work. In this sense, wearable technology could be the right option for the employers to introduce among their workforce for effective co-ordination, synchronization and communication in the blended work model, so that physically divided workforce can be digitally united by the virtue of wearable technology.

12. Conclusion

The organizations should plan to adopt wearable technology and wearable devices to their employees in the work place. Because of this, the organization could yield better outcomes in terms of increased productivity, high employee engagement, task accomplishment and employee well-being physically, emotionally and financially. Also, the relative measures like security, privacy, technical, technological, health, safety and mental well-being aspects should be considered by the organization to overcome the pitfalls of the wearable technology. The organization should backup with robust technological upgradements to cope with up erroneous data and errors. Introducing wearable technology in the work place assures most promising better results for the organization. It could improve the quality of the work ecosystem and push up the work scenario to the next level of progress. It can be concluded that by providing right tools, resources and technological assistance to the employees, the organization could gain higher levels of employee engagement, commitment and satisfaction in their job. Healthier and happier workforce is a productive work force and they are the company's great asset. This study directs the future researchers to experiment which type of jobs and tasks needs the assistance of wearable devices in terms of least and most availed and also the research can be conducted in terms of analyzing, to what extent or to what levels the employees are engaged with particular wearables adopted in the work place.

Author contributions

Rajeswari. A: Conceptualization, Literature data collection, Processing, analysis, writing original draft.
Dr. Gomathi. S: Supervision, Writing-Reviewing and Editing.

Conflicts of interest

The authors declare no conflicts of interest.

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