



ISSN(Online): 2320-9801
ISSN(Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2016

A Survey on Current Scenario of a New Dimension of Technology: Wearable Technology

Harsimrat Deo

Assistant Professor, Dept. of Computer Science, Mata Gujri College, Sri Fatehgarh Sahib, Punjab, India

ABSTRACT: Wearable technology offers many opportunities which trigger the thoughts and imaginations of people of all fields. In this age of technology, the dependence on computers and other interfaces required them to be omnipresent. This requirement paved way for the development of computer based wearable technology, which can assist specialized professionals in personal activities by aiding and augmenting everyday life in the tech savvy world. In reality obstacles imposed by factors such as battery life, processor power, display brightness, network coverage and form factor have led to the delay in the widespread introduction of wearable computers. However in the past, many successful implementations and the continuous relentless efforts to miniaturize computers, promised the emergence of viable applications. In this paper wearable computing applications are reviewed. This paper also highlights the scope and market of wearable technology in India and the way in which it can bring revolutionary changes in our country. The hurdles presented by these applications are identified and discussed.

KEYWORDS: Wearable computing, industry, military, medical, health, fashion, infotainment

I. INTRODUCTION

Research on intelligence is mostly about investigating how brains work or building intelligent machines or creating “smart” environments such as a house that can identify and track its occupants. But what about making people smarter? To accomplish this goal, one can consider biochemistry or bio implants, but the easiest way to improve intelligence is by augmenting the items we wear all the time—glasses, wristwatches, clothes and shoes—with miniature computers, video displays, cameras and microphones. These high-tech “wearables,” can extend one’s senses, improve memory, aid the wearer’s social life and even help him or her stay calm and collected.

The idea of increasing intelligence with wearable devices is very old. English physicist Robert Hooke wrote in 1665 (in the preface to *Micrographia*); “The next care to be taken, in respect of the Senses, is a supplying of their infirmities with Instruments, and as it were, the adding of artificial Organs to the natural.... And as Glasses have highly promoted our seeing ... there may be found many mechanical inventions to improve our other senses of hearing, smelling, tasting and touching.” In the rich canon of science fiction imagined by Isaac Asimov and Philip K. Dick to William Gibson and beyond, people have long been fascinated with a future where humans and machines become one. Whether through high-tech enhancements that restore sight or implants that increase our ability to process and store information, these forward looking visions see the distinction between technology and biology blending into a hybrid state of being where co-evolution is the next phase in human history. And while we might not be quite ready to fully embrace this new era, we’re probably not as far off as we may think. Humankind has always been driven by a desire to augment our natural abilities in order better adapt to and control our environments. Consider the development of primitive tools as an early step in a long road of technical progress that has taken us from animal hides to emotion-reflecting sweaters, Walkmans to iPhones and monocoles to Google Glass. The increased processing speed of chips, capacity of batteries and precision of sensor technologies that have made current devices smaller, faster and more feature heavy, nearly replacing entire electronic categories in the process. What’s more, these innovations are multiplying the rate at which breakthroughs can happen. Alongside this shift, there has been the natural progression in form factors as these same devices move from our desks and pockets to being subtly displayed on our bodies and one day even merged with them. We are at an



ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2016

exciting stage of wearable tech, a growing class of devices that drives users to rethink our relationship with our technologies. It opens the door for new forms of computing that impact the way we live, work and socialize.

What is wearable?

There is massive excitement in the industry about wearable technology. Wearable technology devices or simply wearables refer to electronic technologies or computing devices which are designed to be comfortably worn on the body [1]. Wearable technology tends to provide sensory and scanning capability, such as bio-feedback and tracking of physiological function. Wearables also have communication capability which allows humans to access data in real-time using another connected device or medium. Rapidly evolving examples of wearable devices include smart watches, intelligent eyewear, bio-sensing contact lenses, e-clothing, and smart jewellery, such as rings, bracelets, and hearing aid-like devices that are designed to look like ear rings. In some cases, wearable devices may also be implanted into the human body. Wearable technology devices form a major part of the Internet-of-Things (IoT), and are expected to have a far reaching influence on the fields of fitness, medicine, disabilities, education, transportation, gaming and entertainment. Pervasive connectivity, miniaturization of electronic devices and sensors, along with lowering of costs, have contributed to a rapid increase in the number of wearables being conceptualized and launched in recent times.

Smart watches, smart eye wear, smart bands, and smart shoes are the most common application areas of wearable technology. The top three companies with the highest number of patents and patent applications are Microsoft, Philips, and Alphabet. Geographically, the US has seen the maximum number of patent filings in the domain of wearable technology, followed by China, Japan and Korea.

Wearable technology is clearly gadgets you wear, but there are important distinctions. Wearable tech isn't a trendy pair of headphones, for example, or a digital watch. The new age of wearables tap into the connected self – they're laden with smart sensors, and make use of a web connection, usually using Bluetooth to connect wirelessly to your smartphone [2]. They use these sensors to connect to you as a person, and they help you to achieve goals such as staying fit, active, losing weight or being more organized.

How do you wear them? Most wearables are wrist worn, but an increasing number can be clipped to the body and hung around the neck. Wearables are quickly blending with jewellery, and are worn in the same way. Watches, rings, pendants – you name it, there's a wearable that does it.

What kinds of wearables are there? There are a few different categories of wearables at the moment. Some products manage to get their feet in more than one camp and a few others define new categories all of their own [3, 4].

➤ Smartwatches are wrist-worn devices that connect to your mobile phone to act as mini-windows onto your digital life. Telling the time is simply an after-thought of these wrist watches; they'll tell you about the notifications of calls, messages and usually email and social media as well [5].

➤ Fitness trackers - Fitness trackers come in all sorts of shapes, sizes and levels of sophistication too. Usually worn on the wrist or clipped to a belt, they're generally bands or watches of some sort which will keep a count of the number of steps you make each day. The newest bands are adding continuous heart rate monitoring, for even more accurate data on your calorific burn and exercise.

➤ Sports watches- For those active types who love running, cycling, swimming and more a dedicated sports watch should be at the top of your wearable wish list [6]. These devices should have GPS and can provide another level of information about your chosen sport, and take your training to the next level.

➤ Head-mounted displays If you want some kind of virtual information delivered right to your eyes, then a head-mounted display (HMD) is what you'll need. Some are designed to block out the rest of the world, like Oculus Rift, and present a computer-generated virtual reality to fool your brain into thinking it's somewhere else entirely.

➤ Smart clothing is a rather broad category which encompasses both garments with electronics in that make them look more interesting or fashionable, as well as clothing that essentially appears normal but houses additional functionality. It's predicted that over the next few years a lot of the features in fitness trackers will find their way to smart garments.

➤ Smart jewelry Brands like Kovert Designs have brought the idea of smartwatches to items of jewelry finding ground somewhere between the two. Smart jewelry is mostly aimed at women right now, and the most common usage is to discreetly notify the user of texts, calls or emails when their phone is out of reach.

➤ Implantables are a group of wearables that you have no choice but to carry with you wherever you go. These are devices surgically attached somewhere under your skin. They might be for medical reasons, like insulin pumps, or



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2016

for contraception or, on the other hand, you might just fancy sticking some magnets in your fingertips. Yeah, that's a thing. Take a closer look at the world of implantables, and expect it to get a whole lot bigger in the next 20 years

These are products that must be worn on the user's body for an extended period of time, significantly enhancing the user's experience as a result of the product being worn. Furthermore, it must contain advanced circuitry, wireless connectivity and at least a minimal level of independent processing capability. – This definition of Wearable Technology stipulates two tests that products must pass to be considered within the scope of this research.

Test 1 - Wearable – being worn for an extended period of time, with the user experience significantly enhanced as a result.

Test 2 - Smart – having advanced circuitry, wireless connectivity and independent processing capability.

These are forthwith referred to as the two tests of Wearable Technology.

II. LITERATURE REVIEW

In[1] the author states that in this age of technology, the dependence on computers and other interfaces required them to be omnipresent. Wearable technology offers many opportunities which trigger the thoughts and imaginations of people of all fields. Authors in [2] focused on the inevitability of computers and interfaces which are small enough to be worn on the human body has inspired the creation of devices and applications which can assist with specialized professional and personal activities, as well as aiding and augmenting everyday life in the modern world. In [3] the author tried to give a new dimension to the technology by co relating the technology with latest trends and fashion. The interplay of electronic textiles and wearable technology, wearables for short, and fashion, design and science is a highly promising and topical subject. In [5] the author pin pointed the obstacles In reality. The obstacles imposed by factors such as battery life, processor power, display brightness, network coverage and form factor have led to the delay in the widespread introduction of wearable computers. In [7] the author states that here are wearable technological devices that amuses people and help them live healthier lives. They are devices that can detect body temperature, heart beat/rate, hydration level, day to day activities, sleeping patterns, and much more than we can expect. Wearable technology includes many items such as fitness bands, smartwatches, glasses, clothing, jewelry and other electronic devices. In [8] the author states that Wearable computing hopes to shatter this myth of how a computer should be used. A person's computer should be worn, much as eyeglasses or clothing are worn, and interact with the user based on the context of the situation. With heads-up displays, unobtrusive input devices, personal wireless local area networks, and a host of other context sensing and communication tools, the wearable computer can act as an intelligent assistant, whether it be through a Remembrance Agent, augmented reality, or intellectual collectives. Apart from describing wearables, the author in [9] highlights the pros and cons of the technology. In [10] the author explains that smart clothes and wearable technology is a unique and essential reference source for researchers, designers and engineers developing textiles and clothing products in this cross-disciplinary area. It is also beneficial for those in the healthcare industry and academics researching textiles, fashion and design.

III. APPLICATIONS

Five categories of wearable technology are assessed in this report and defined as follows [7]:

- Fitness and Wellness - Devices which pass the two tests of wearable technology and are used in the monitoring of activity and emotions.
- Healthcare and Medical - Devices which pass the two tests of wearable technology and require FDA or equivalent approval. They are used in monitoring of vital signs, as well as for augmenting senses.
- Industrial – Devices that pass the two tests of wearable technology and receive/transmit real-time data in military and/or industrial environments.
- Infotainment - Devices that pass the two tests of wearable technology and are used to receive and transmit real-time information for entertainment or enhanced lifestyle purposes.
- Military- Devices that pass the two tests of wearable technology and receive/transmit real-time data in military and/or industrial environments.



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2016

In the table given below few products are categorized broadly into five categories discussed earlier according to the application areas [8] as :

Table1: Applications of Wearable computing [9]

Applications	Product categories
Fitness and Wellness	Blood pressure monitors, Insulin pumps, Continuous Glucose Monitoring, Smart Glasses, Defibrillators Patches, Drug Delivery Product, Pulse Oximetry, ECG Monitoring, Insulin pumps, Hearing Aids
Healthcare And Medical	Activity Monitors - Sleep Sensors Emotional Measurement - Smart Glasses Fitness & Heart rate Monitors - Smart Clothing Food Pods & Pedometers - Smart Watches Heads-up Display - Audio Ear buds
Infotainment	Bluetooth Headsets Head-up Displays Imaging Products Smart Glasses Smart Watches
Military	Bluetooth Headsets Head-up Displays Imaging Products Smart Glasses Smart Watches
Industrial	Hand-Worn Terminals Head-up Display Smart Clothing Smart Glasses

IV. BENEFITS

There is a wide range of benefits of wearable technology which are as follows[10, 11]:

Personal assistant: Wearables on many levels were created in an attempt to simplify our daily functions. The idea is that analyzed data and critical information will be at the user's immediate disposal, simplifying daily functions dramatically and making us more productive and efficient than ever before.

Allow you to stay better engaged with your environment: For the most part, the usage of a smartphone or a tablet is a solitary activity, the screen forming a dividing wall between you and the outside world. Wearable tech largely eliminates that wall. Sure, glancing down at a watch's face is similar to looking at a screen, but it's much less involved. When it comes to devices like Google Glass the level of immersion possible is quite remarkable. Doing away with standard screens entirely, Glass and its ilk present an incredibly exciting and revolutionary way of engaging with personal technology. Indeed these pieces are generally just more convenient than smartphones or tablets.

More discrete: This is kind of a tricky topic, as the discreetness of devices like Google Glass could also lend the product to some less savory applications as well. However, for the most part the discreet nature of wearable tech is a



ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2016

positive thing. For example, remember that bracelet I mentioned earlier, the one which can alert you to the existence of any and all Facebook messages? Well, it can actually alert you to quite a bit more, including phone calls the user has received. Previously, to learn that same information the student would have had to pull out their phone or their computer, potentially disrupting the class (or, at the least, their own learning) and earning the scorn of their teacher. Now a student can learn essentially the same information in a much quieter, far less obtrusive manner. This is one example of the discreet nature of wearable tech benefiting not only the user, but their environment as well.

Potentially more fashionable: One of the most interesting ways that portable technology has progressed is in the area of aesthetics. Interestingly enough, many buyers seem to care just as much, if not more in some cases, about a device's sleek look as they do its performance or capabilities. Tech companies have become set upon making their devices smaller, sleeker, lighter and more intuitive. As such, tech like pads and pods and, of course, phones have almost become fashion accessories to some. However, because they are replacing items like standard glasses and jewelry wearable tech has an even more centralized focus on being fashionable. If these items don't look as good as possible their appeal will be greatly limited. After all, who would want to wear an ugly bracelet or a pair of glasses that did not compliment their face? Some won't care much for the look of the pieces, buying them solely for their technological capabilities, but for others aesthetics will be very important, and the companies who make these products will need to recognize that.

V. DRAWBACKS

In spite of many useful features there are still some drawbacks of wearable technology which are as follows[11]:

Less versatile: Clearly, wearable tech can do plenty that standard smartphones and tablets can't do, but they also have some pretty serious limitations. For example, you're not going to want to write an email on a watch, and while your bracelet may light up to let you know when you've received a message it's not going to allow you to see it or respond to it. Most pieces of wearable tech aren't going to come with keyboards because there's simply nowhere to put them. You're also probably not going to use a watch or a pair of glasses to make a phone call. Whereas iPad and Androids are machines of many facets, most wearable tech is built around one very specific purpose. What that purpose is changes from machine to machine, but one constant remains: these devices simply aren't as versatile as smartphones in some areas.

Smaller: Here's one of the most obvious complaints one might have about wearable tech. It's also a complaint which doesn't apply at all to Google Glass, or to that bracelet I mentioned earlier. However, the fact remains that you're generally not going to want to wear a piece of jewelry which is as big as an iPad or even a smartphone. That means that, generally speaking, wearable tech will be smaller than your average phone or tablet. That might make certain tasks harder to accomplish, like browsing the internet for example.

Not as widely accepted: This is the kind of thing that will change in time as people get used to its presence, but for the foreseeable future people who utilize wearable tech are going to be seen as outcasts. This prejudice has already reared its ugly head, as evidenced by the story of Steve Mann, an inventor who was attacked in a Paris McDonalds by three men who were fearful of the EyeTap Digital Eye Glass he was wearing. Currently, wearable tech is not widely understood or accepted by the masses, and it won't be until it becomes more widespread. So for now, if you want to use Google Glass in place of a smartphone don't be surprised when you get some weird looks.

Data accuracy: One aspect that needs to be better developed in many wearables is the actual accuracy of the physiological measurements. It seems that wearables in general and smartwatches in particular, just haven't been able to retrieve and measure the data with sufficient accuracy. Sensors will need to be better positioned or used and data better analyzed

VI. RELEVANCE OF WEARABLE TECHNOLOGY IN INDIA

In a country like India which has various social, economical, cultural, geographical, climatic and political diversities, wearable computing has immense scope and has large umbrella of applications under its fold. It has a considerable market niche and can make a mass appeal to attract a huge number of customers due its wide range of applications. [8]

1. Wearables can be extremely beneficial in villages where majority of the people are uneducated. These people are often victims of debauchery and trickery. Wearables can provide them easy access to relevant information at the



ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2016

required time and hence educate them about the situation. Also farmers can require info about their crops and land leading to increase in yield and hence income which might be reflected in the nations GDP in urban areas such wearables can help in reduction of time and effort while processing transactions.

2. Wearables can also help in the improvement of health by not only monitoring the health aspects of a person but also reducing the need to frequently visit the doctor. This is of special importance to people living in the remote areas since it reduces the cost and expenditure and also reduces the severity of transport requirement. Also old people can benefit from it by being under constant care since the wearables can be made to transmit information of the patient's health to their doctors. By improving preventive care and giving residential monitoring it is possible to decrease readmission rates to improve patient outcomes and decrease mortality rate.

3. Safety in India has been a rising concern. Several wearables are available that could be used to communicate and provide location information of the user. This is particularly useful for women safety who when in danger can inform her near ones and hence call help. Parents leaving their children in daycare can constantly monitor their activity and be sure of their well being. Location providing wearables in combination with health monitoring ones are also used by animal explorers by providing information about the animal's health and activities irrespective of the conditions.

4. A wide range of sports and games are played in India. But not all are equally preferred mainly due to the lack of facilities. Wearables can improve the condition by providing stylish yet simplistic and light gears to wear. This will attract the attention of people who might play the sport just for the fun of using them. Also wearables provide a better sports experience by constantly monitoring the sportsman and providing other recreational facilities. These wearables may be particularly useful for Professional athletes, Recreational Fitness Consumers, Clinical and Military research, Corporate Wellness programs, and Chronic Disease management.

5. Indian industries may experience a boon in production by using wearables which will help in easier and better manufacturing processes besides also providing safety and comfort. Industrial applications of Wearable Technology include the use of heads-up displays in production lines, hand-worn terminals in logistics and warehousing and smart clothing to track user location and detect industrial gases.

VII. FUTURE OF WEARABLE TECHNOLOGY

Regardless of these pros and cons, wearable tech is obviously a hugely exciting concept. Far from being so far-off pipe dream, there are many products being produced right now which could easily be placed under that banner head. Some have even already been released, though in limited numbers for the most part. While wearable tech won't be replacing smartphones any time soon, and likely won't be widely used for years to come, the future is bright for this fledgling industry. There was a time when cell phones were rare and their usage seemed strange and disagreeable to some. That time has obviously passed us by. Wearable tech will go through the same process. At first, it'll seem strange and perhaps a little scary, but as time continues on these products will almost certainly become hugely popular. They have too much potential to be ignored. So keep an eye on wearable tech. It's here to make our lives easier, to grant us new opportunities and, maybe, to change the way we interact with the world as a whole, and with each other.

VIII. CONCLUSION

Wearable computing enables significant new research opportunities in interface, artificial intelligence, and perception. As research into perception and user modeling through devices carried on the body progresses, new intelligent interfaces will result that will reduce work and complexity and lead to new capabilities. However, by simply making eye catching and lucrative wearable technology will not serve the purpose until it reaches out to the massive population and their full market potential is tapped.

REFERENCES

1. Jhajharia, S., Pal, S. K., Verma, S., "Wearable computing and its application", International Journal of Computer Science and Information Technologies, Vol. 5, pp. 5700-5704, 2014.
2. Randell, C., "Wearable computing: A review", Department of computer science, University of Bristol, U.K. [www.cs.bris.ac.uk / Publication/Papers/2000487.pdf](http://www.cs.bris.ac.uk/Publication/Papers/2000487.pdf).
3. DARPA, Proceedings of the Wearables in 2005 Workshop, www.darpa.mil/MTO/Displays/Wear2005.



ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2016

4. Seymour, S., "Fashionable Technology, The intersection of Design, Fashion, Science and Technology", Springer Publishing Company, 2008.
5. Lind, E.J., Jayaraman, S. Rajamanickam, R., Eisler, R. and McKee, T., "A sensate liner for personnel monitoring applications", First International Symposium on Wearable Computers, 1997.
6. <http://www.cnn.com/2013/06/28/Future-Fashion-10-Wearable-Tech-Trends-to-Watch.html>
7. <https://www.cognizant.com/InsightsWhitepapers/wearable-devices-the-next-big-thing-in-crm-codex984.pdf>
8. <https://www.media.mit.edu/wearables/mithril/intro/topic2.html>
9. <http://www.humavox.com/blog/wearable-technology-pros-cons>
10. McCann, J., Bryson, D., "Smart Clothes and Wearable Technology", Woodhead publishing textiles.
11. <https://net.educause.edu/ir/library/pdf/eli7102.pdf>