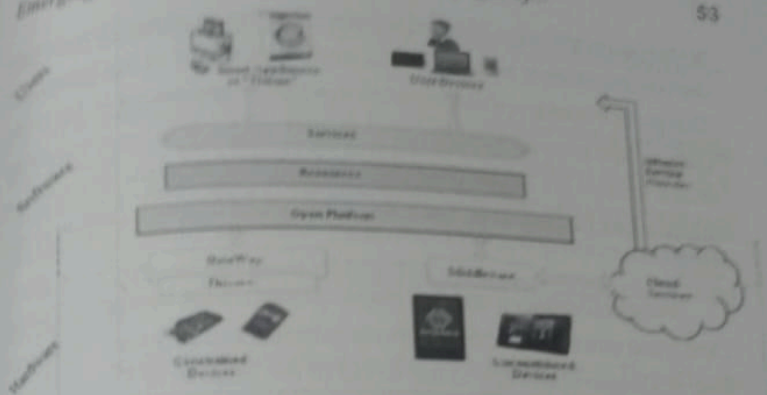

Figure 4.6: Architecture of Internet of Things
(Administrator, 2020)

One of the major challenges on the Internet of Things is related to precision. When objects are allowed to operate by themselves precision plays a major role. In scenarios of manufacturing machines, there may a failure in the system if there is a slight difference in time and the need to device electronic sensors and other actuators is a great challenge in the Internet of Things. It is believed that by 2020, more than 50 billion objects will be connected through the Internet of Things. Many start-ups do not have the adequate technical knowledge to produce electronics to support the Internet of Things. This, in turn, poses a huge challenge to the Internet of things (Vanessa Gentile, 2016)

The Technology of the Internet of Things is aimed to act as a bridge between the real world and the digital scenario. A hyper-connected society is being aimed at with the evolution of the technology of the Internet of Things. Devices besides exchanging data are made to be more intelligent. This demands high performance in sensing and processing technologies (Imran et al., 2020).

Scalability is a major challenge in the context of the Internet of Things. Scalability may be of two types namely vertical scalability and

Advancements in technology have resulted in connecting to the cloud ecosystems. Big data technology and the need for higher Internet speed are acting as major challenges to the development of electronic devices that can be used for Internet of Things applications.

Internet of Things may be defined as the interconnection of objects that are embedded with electronics and software in which communication is established with each other. It may be thought of as a merger of automation and analytics to arrive at new technology. It involves the use of the technologies of networking, big data, sensing and artificial intelligence. In short Internet of things demands the need for smart devices in which sensors are embedded and that involves communication by using the Internet. These requirements additionally need efficient and various sensors design and this is a challenge to be faced by the makers of electronics for the Internet of Things.

4.4.1 Internet of Things: An explanation

Internet of things may be defined as a concept in which the objects around us namely the phones, TV's lights, refrigerators, Air conditioners, etc. monitors, sense, and interact among themselves. These interactions may be controlled by humans or may not be under the control of humans. Internet of things is considered to be a major technical revolution of the Internet. The controlling of various things can be carried out via either Wired Internet Connection or wireless Internet Connection.

IoT denotes the interconnection of physical objects that are embedded with electronics, sensors, actuators, and software to exchange data. Washing machines, coffee makers, and other objects can be controlled remotely by the way of the Internet of Things. The sensors may be controlled by different local area connections like ZigBee, Bluetooth, RFID, Wi-Fi, and by using wide area networks like GSM, GPRS,3G,4G, etc (Administrator, 2020)

real-time data analysis and it is beneficial to both the doctors and the patients. This can be applied to any other health monitoring aspect and it has its benefits.

Wearable application is beneficial to both computation technology and information processing. Although many say that wearable devices which are either implanted or in constant contact with the human body can leak much personal information there are several benefits because these. Wearable devices will be in the future for all human assistance.

4.3 Demerits of Wearable Technology

Although several benefits of wearable devices were cited there exist several risks and demerits that need attention. Security leaks are the major drawback experienced in the field of wearable electronics. Subjects related to the integration of technology and fashion are yet another demerit in the area of wearable electronics. The amount of information generated is a subject of worry in this field. Hence the consumer electronics that can be used every day suffer from the benefits as well as the drawbacks.

The major requirement for such products is they have to be small in size and easy to wear and consume less power. The electronic gadgets which an individual can wear are called wearable hardware. These are worn to assist the people intelligently.

4.4 Internet of Things and its collaboration with Wearable Electronics

The technology in which smart devices are connected through the Internet to exchange data in real-time is termed Electronics & IoT. The product development to support IoT to deliver the expected performance is highly complicated. A variety of challenges needs to be answered when products to support IoT are to be developed.

Figure 4.5: Wearable Technology *(Shailendra Sinhasane, 2018)*

4.2 Benefits of Wearable Technology

Many reasons could be attributed to aid the growth of wearable electronics in daily consumer products. Feedback about health, the ability to perform self-monitoring, and the accurate integration of computing technologies are some of the reasons for people to depend more on wearable electronics for a variety of purposes.

A recent study revealed that many use wearable electronics products to increase their exercise. Sensors were attached to different runners and the data collected was useful in analyzing the performance of the runners. This helped the athletes to improve their running ability and work on their areas of less performance. This in turn made suggestions as to what type of exercise they can adapt to improve their performance.

Wearable electronic products can be applied in the field of medicine in some other form. By using a heart monitor with a wearable electronic device that is connected to the Internet the doctors can get data related to the cardiovascular health status of the patients. This paves way for

processed and sampled and made into a form that a computer can read. This digital signal is then processed by computing technologies.

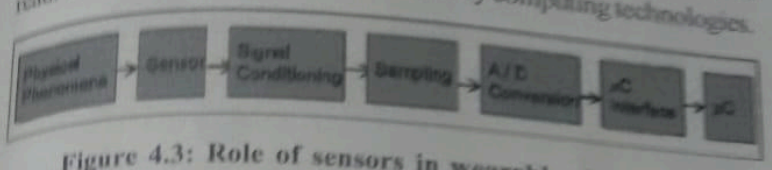

Figure 4.3: Role of sensors in wearable electronics *(Andrew Carp | Electrical and Computer Engineering Design Handbook, n.d.)*

Smartwatches, smart glass, fitness trackers, Bluetooth headsets, headphones are some of the applications in which the concept of wearable electronics is used. Figure 2 is a diagrammatic representation of the products that can be categorized as wearable electronics products.

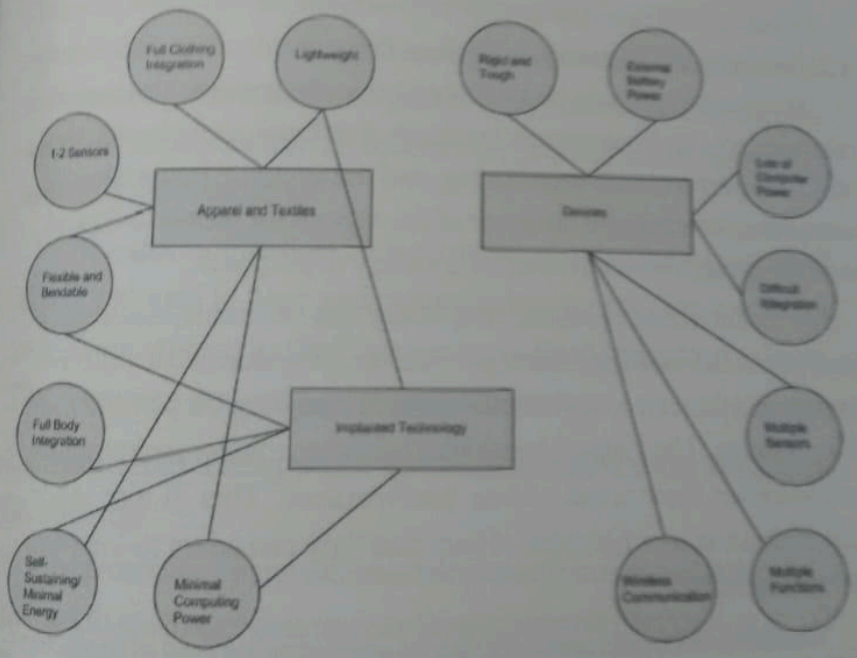

Figure 4.4: Wearable electronic product types *(Andrew Carp | Electrical and Computer Engineering Design Handbook*, n.d.)

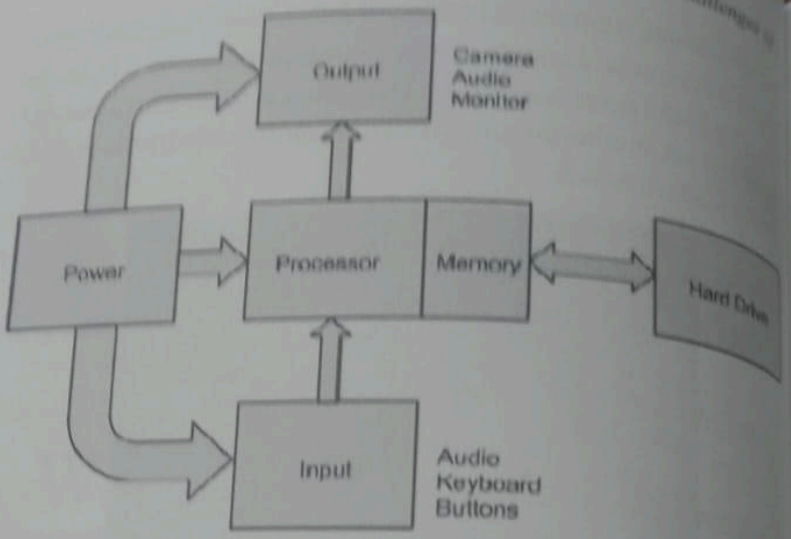

Figure 4.2: Different parts of a computer

Apart from the improvement in transistor technology the availability of several low-power devices contributed to the development of wearable electronics. These low-power devices do not require huge battery power and this is one feature on which wearable electronics is built upon. The availability of hard drives that are small in size helped in improving the computing speed.

The advancement in sensor technology is one area that was responsible for the availability of numerous devices that fall under the category of wearable electronics. A sensor responds to changes in the environment variable. The sensor will produce some suitable output. The output of the sensors is electrical and they are fed as input to perform some computational process.

The figure below depicts the role of sensors in detecting various environmental variables. The sensors act on certain physical parameters like audio or video and create a signal that is in the form of either voltage or current. The signal obtained as the output of the sensor is

inment, consumer, Finance, Athletics, retail, and many more.
a common example of wearable electronics which is used to
health status at workouts. This comes in the form of a bracelet.
is yet another commonly used wearable electronic product
a smartwatch.

Figure 4.1: Fit bit, a wearable device

echnology of wearable Electronics

chnological advancement namely improvement in size,
s in battery, power, memory, and other technologies have
use for the advancements in the wearable electronics field.
contributor to the advancements in wearable electronics is
echnology. Transistors are the basis for the majority of
omponents in the present day. In recent years numerous
roduce chips with billions of transistors in them. Transistors
ed to be the basis for computing technology. They aid in
k of information and carrying out various calculations.
rs are also useful in reading data and are the basic building
ajority of computer components. This made innovations
electronics to a large extent. The figure below shows the
ponents of the computer which is also the building block
electronics.

4 WEARABLE & TRANSPARENT ELECTRONICS

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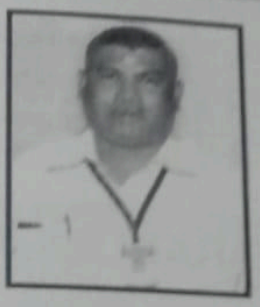
Wearable electronics is a fairly new term that has become the buzzword in the present day. Apart from watches and hats and other clothing other fields namely medical, academia and consumer electronics are in the process of reconnoitring the effectiveness of this new technology. Some examples of wearable devices are smartwatches, fitness bands, etc. Wearable electronics finds applications in many areas. These are used in a plethora of areas namely Data acquisition, live monitoring, Communication, etc. The applications of wearable electronics are dependent on the level of proximity these devices experience with the human body. Wearable electronics are applied in other fields namely medical and military and many more. Pesticide levels in children were estimated using wearable GPS (Shailendra Sinhasane, 2018).

Wearable electronics products find applications in a variety of fields. The application range varies between rigid computing devices the flexible electronic fabric. Wearable electronics find applications in different fields namely military, healthcare, academics, Agriculture,



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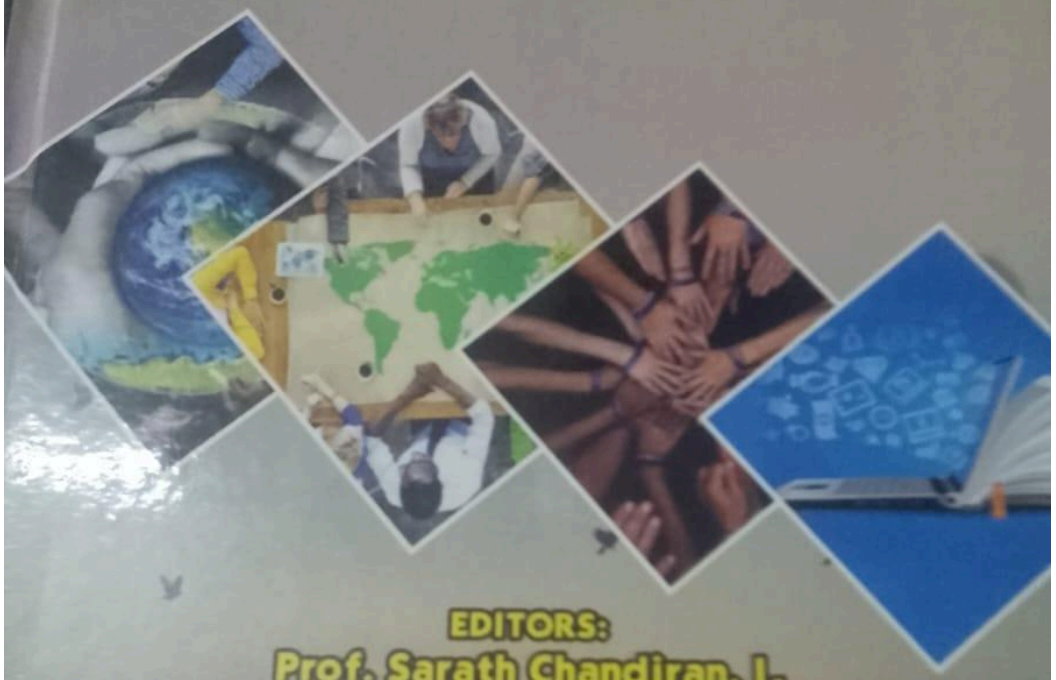

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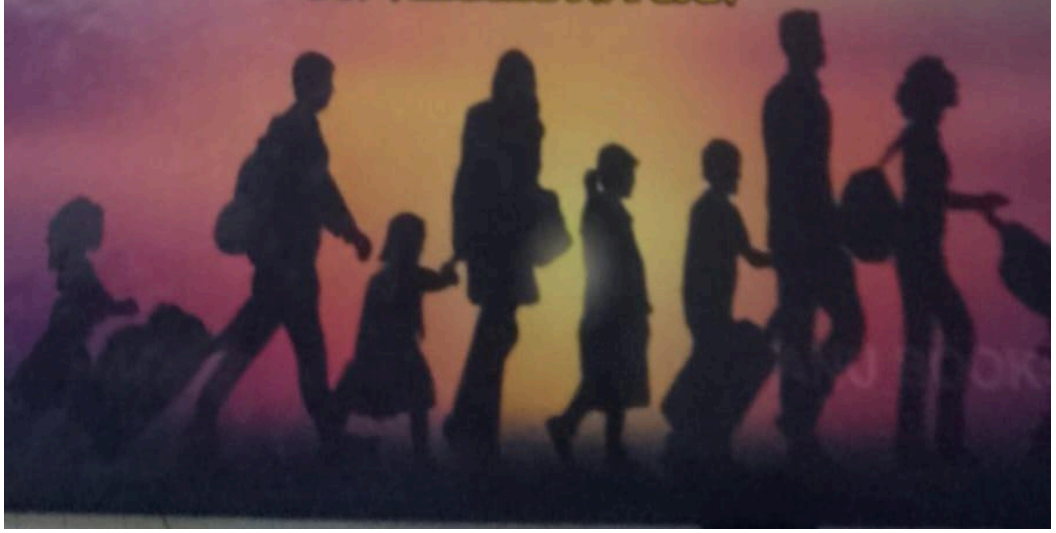

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