

**A**  
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Sincerely,

Isha P. Jariwala

# INTERNET OF BEHAVIOUR

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## 1. Abstract

The Internet of Behaviours (iob) is a branch of the Internet of Things (iot) that can develop patterns to affect people's behaviour. It is a combination of three fields: technology, data analytics, and behavioural psychology.

The Internet of Behaviour (iob) is an emerging concept that describes the integration of data analytics, behavioural psychology, and the Internet of Things (iot) to understand, analyze, and influence human behaviour .Iob find out the benefit data collected from various sources, such as connected devices, social media, and other digital platforms, to gain insights into individual and collective behaviours .By analyzing this data, organizations can products, services, and experiences to better meet the needs and preferences of users. Iob also raises significant privacy and ethical concerns regarding the collection and use of personal data. And the Internet of Things (iot) to understand, analyze, and influence of human behaviour.

Internet of Behaviours (iob) aims to discuss how data are better understood and used to construct and promote new products from the view point of human psychology. Iob platform allows developing an in-depth understanding of clients that every company needs.

The Internet of Behaviour can predict human behavioural trends in the future and even change human behaviour, which can provide more convenience for human life. With the increasing prosperity of the Internet of Things, more and more behaviour-related data is collected on the Internet by connected devices such as sensors. People and behaviour are connected through the extension of the Internet of Things – the Internet of Behaviour. Internet of Behaviour and define its development direction in terms of three aspects: real-time, autonomy, and reliability.

The most obvious and effective examples of capitalizing on the Internet of Behaviours are Face book, Google, and Meta which provide adverts to surfers at regular intervals based on detailed analysis and understanding gained from customer behavioural data obtained on a regular basis.



## 2. Introduction

Internet of Behaviour refers to an extension of the Internet of Things (iot) that focuses on collecting and analyzing behavioural data from humans. While iot primarily focuses on connecting physical devices and collecting data from these devices, iob takes a step further by evaluating human behaviour based on data collected by these devices.

The term "iob" refers to a method of analyzing user-controlled data from a behavioural psychology standpoint. The findings of that study influence new ways to create a user experience (UX), search experience optimization (SXO), and how to advertise a company's final products and services.

Iob can't be talked about without the mention of iot. The Internet of Things (iot) is an interconnected network of physical devices that gather and share data and information via the Internet. The Internet of Behaviour refers to the gathering of data (BI, Big Data, cdps, etc.) That offers important information on client behaviours, interests, and preferences (iob).

Iob entails gathering data via sensors, wearable devices, smart phones, and other technologies that monitor human behaviour. This data may include information on purchase behaviours, internet surfing habits, social media interactions, physical movements, health, and other topics.

The Internet of Behaviours (iob) is an area of research and development (R&D) that seeks to understand how, when and why humans use technology to make purchasing decisions. Iob combines three fields of study: behavioural science, edge analytics and the Internet of Things. Among the large companies in the iob world, Facebook, Google and YouTube are using when showing ads to users. Uber monitors many behavioural parameters of passengers and drivers to improve the quality of service.

From a behavioural psychology standpoint, the iob tries to comprehend the data acquired from users' online activities. It aims to answer the question of how to interpret data and how to use that knowledge to develop and promote new goods, all from the perspective of human psychology.

**Fun Fact:-**

The term “Internet of behaviour” was first introduced by Gothe Nyman, who was working as a professor of psychology at the University of Helsinki.



Many cited 2012 as the opening date of IoB when psychology professor Gothe Nyman described the possibility of obtaining detailed data on customers’ use and behaviour as they interact with the Internet of Things (IoT). But the idea of analyzing data received from consumers for business purposes is not new. As we have done research on consumer behaviour and habits in the past, we now have an automated ecosystem of analytic processes that track, collect, and attempt to interpret the vast amounts of data we generate through our online and Internet activities.

The internet of behaviours is a system that uses data collected from people’s interactions with products or services to provide insights into their behaviour. This data can be used to create personalized experiences for customers and more accurate predictions about future behaviours. It can also identify trends in customer behaviour or preferences across different demographics or regions.

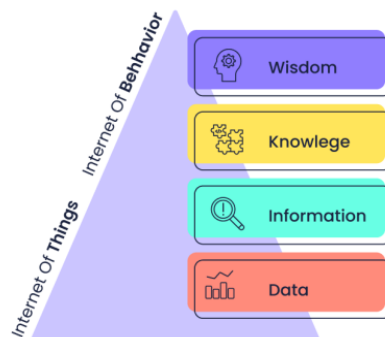
The IoB concept seeks to address how to understand data properly and apply that understanding to create and promote new products – from a human psychology perspective. The Internet of Behaviour collects the digital dust of people’s lives from a variety of sources, and public or private organizations can use this information to influence behaviour.

The web platform example when a user interacts with it from a laptop, and another time from his smart phone. The data will differ in how the user interacts with the resource, namely which buttons he clicks, how he moves around the page. Thanks to this approach, it becomes clear the path that leads to the sale. Everything we have listed is all the data that can be collected using analytics, and this is what makes up the Big Data concept.



This term is related to behavioural science. In other words, the IoB concept is to use the result of data analysis to create UX design, get a new approach to search experience optimization, or change the way of product marketing. Another term related to IoB is the Internet of Things (IoT), as technically, all the data gathered from IoT and other sources are used to influence consumer behaviour. Organizations can use the data for different reasons, for example:

- To measure the effectiveness of their campaigns,
- To measure the patient's activity (health providers can use these features),
- To personalize content.



However, there are also some potential risks associated with IoB. For example, IoB systems could be used to collect data about us without our consent or knowledge. This data could then be used to discriminate against us or to violate our privacy. It is important to be aware of these risks and to take steps to protect our privacy.

Overall, IoB is a powerful new tool that has the potential to improve our lives in many ways. However, it is important to use this tool responsibly and to be aware of the potential risks.

### 3. Contributors

Several companies and individuals have played a significant role in the development of IoB. Here are some of the key contributors:

**a. Gartner:**



As mentioned earlier, Gartner is the company that coined the term “Internet of Behaviour.” Gartner is a well-known technology research company that provides insights and analysis to businesses worldwide.

**b. Google:**



Google has been a significant contributor to IoB, with its products like Google Analytics, which provides website owners with data on user behaviour, and Google Assistant, which uses machine learning to understand user behaviour.

**c. Facebook:**



Facebook is another company that has contributed to IoB. Facebook collects vast amounts of user data, which it uses to target ads and personalize the user experience.

**d. Amazon:**



Amazon is known for its e-commerce platform, which is powered by algorithms that use customer behaviour data to recommend products.

**d. Microsoft:**



Microsoft has also been involved in the development of IoB, with its Cortana virtual assistant, which uses machine learning to personalize the user experience.

## 4. Structure and Working

The idea of IoB is to use this data to change behaviour. The implementation of IoB in different industries can vary. For example, there is a solution for the logistic market well-known as telematic. Cprime has broad expertise in building telematics solutions for commercial vehicle tracking. Telematics can analyze real-time data on a vehicle's location, speed, fuel consumption, route, or driving behaviour to improve the logistics.

For instance, the data can be shared with insurance companies to get accurate information on breakdown or incident reasons. It also helps to manage the workload and delivery schedule in real-time. Telematic solutions for fleet management are an example of implementing IoB for this industry.

It is also important to mention that IoB has ethical implications depending on the goals of using it. That is why privacy laws have a significant impact on the adoption and scale of the IoB.

All the devices connected to the internet or synchronized provide a vast amount of different data. At the same time, it is not something new for us. Every time we open social media, the platform gets information on what we were doing on the site. IoB is focused on specific data. For example, it analyzes what page you opened, how long you have been scrolling it, what page you launched after that, how many times you did the same set of operations? For example, you can predict that you are going on vacation at the beginning of January and can not decide where to go – Miami or Los Angeles. The IoB will use this data to provide you with the most accurate advertisement on those destinations on specific dates.

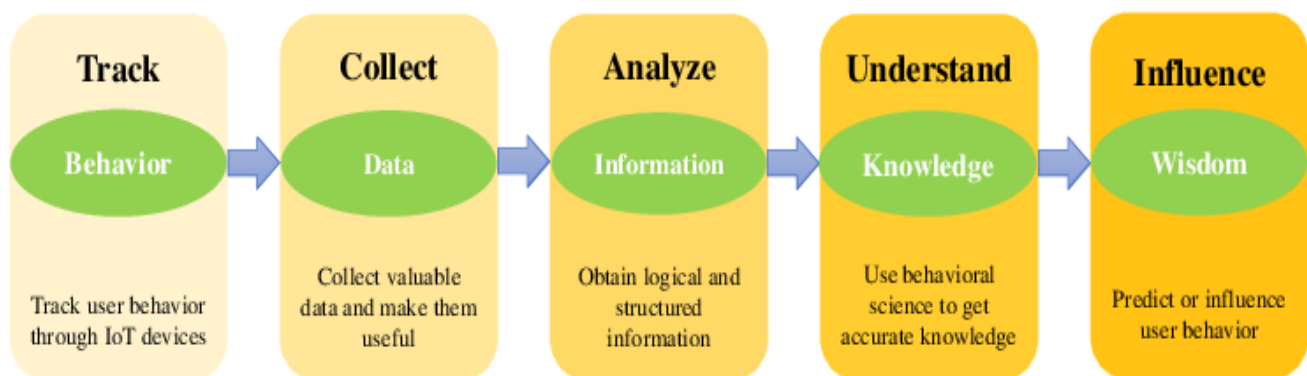
IoB is a revolutionary technology that enables the monitoring, control and modelling of human behaviour. It combines the power of the technologies mentioned above to provide an unprecedented level of insight into how people interact with their environment. IoB has been used in various industries such as healthcare, retail, finance, education, transportation and more.

The Internet of Behaviour (IoB) refers to the use of data from various sources, such as social media, sensors, and other digital platforms, to understand and influence human behaviour. It involves analyzing and interpreting data to gain insights into people's actions,

preferences, and habits. This information can then be used by businesses, governments, or organizations to tailor their products, services, or policies to better meet the needs and desires of individuals. Examples of IoB applications include personalized marketing, behaviour-based pricing, and targeted health interventions.

However, it also raises concerns about privacy, data security, and ethical implications. The IoB is a network of interconnected physical objects that collect and exchange information over the Internet, linking this data to specific human behaviours, its workflow is as follows:

- Use sensors and terminal devices connected to the IoT to track the behaviour of users;
- Collect and make available for analysis all types of useful data generated by IoT devices on an ongoing basis;



- Use data analysis and machine learning algorithms to sort and analyze the processed data to obtain logical and structured information;
- Mining useful information with specific patterns and using behavioural science and artificial intelligence algorithms to understand exactly how those patterns affect human behaviours;
- Use corresponding knowledge to make decisions independently, predict user behaviour, or influence user behaviour towards the expected direction.

## Internet of behaviour working in Healthcare

The Internet of Behaviour (IoB) in the healthcare industry refers to the collection, analysis, and utilization of data related to individuals' behaviours to enhance healthcare services, improve patient outcomes, and optimize operational processes. This concept leverages various technologies, including IoT devices, sensors, wearables, and data analytics, to gather and interpret behavioural data. Here's an overview of how IoB works in the healthcare sector:

### **a. Data Collection:**

**Wearable Devices and Sensors:** IoB relies on wearable devices and sensors that can monitor various health-related parameters such as heart rate, physical activity, sleep patterns, and more.

**Electronic Health Records (EHR):** Integration with EHR systems allows healthcare providers to access historical patient data, including medical history, treatments, and outcomes.

### **b. Data Processing and Analysis:**

**Data Analytics:** Advanced analytics, including machine learning and artificial intelligence, process and analyze the collected data to identify patterns, trends, and correlations. This can provide insights into patients' behaviour, adherence to treatment plans, and overall health status.

**Real-time Monitoring:** IoB enables real-time monitoring of patients, allowing healthcare professionals to intervene promptly in case of anomalies or deviations from normal behavior.

### **c. Patient Engagement:**

**Personalized Healthcare:** Insights derived from IoB can be used to tailor healthcare plans and interventions based on individual behaviors. This personalized approach can lead to more effective treatments and improved patient engagement.

**Behavioural Interventions:** IoB can help healthcare providers develop targeted interventions to address specific behaviours, such as medication adherence, lifestyle modifications, and preventive care.

### **d. Operational Efficiency:**

Resource Optimization: IoB can be applied to optimize hospital operations, including staff management, resource allocation, and patient flow, based on observed behavioural patterns and trends.

Predictive Maintenance: For medical equipment and devices, IoB can help predict maintenance needs and prevent breakdowns, ensuring continuous and reliable healthcare services.

**e. Privacy and Security:**

Data Security Measures: Given the sensitive nature of health data, IoB implementations in healthcare must prioritize robust security measures to protect patient privacy and comply with data protection regulations.

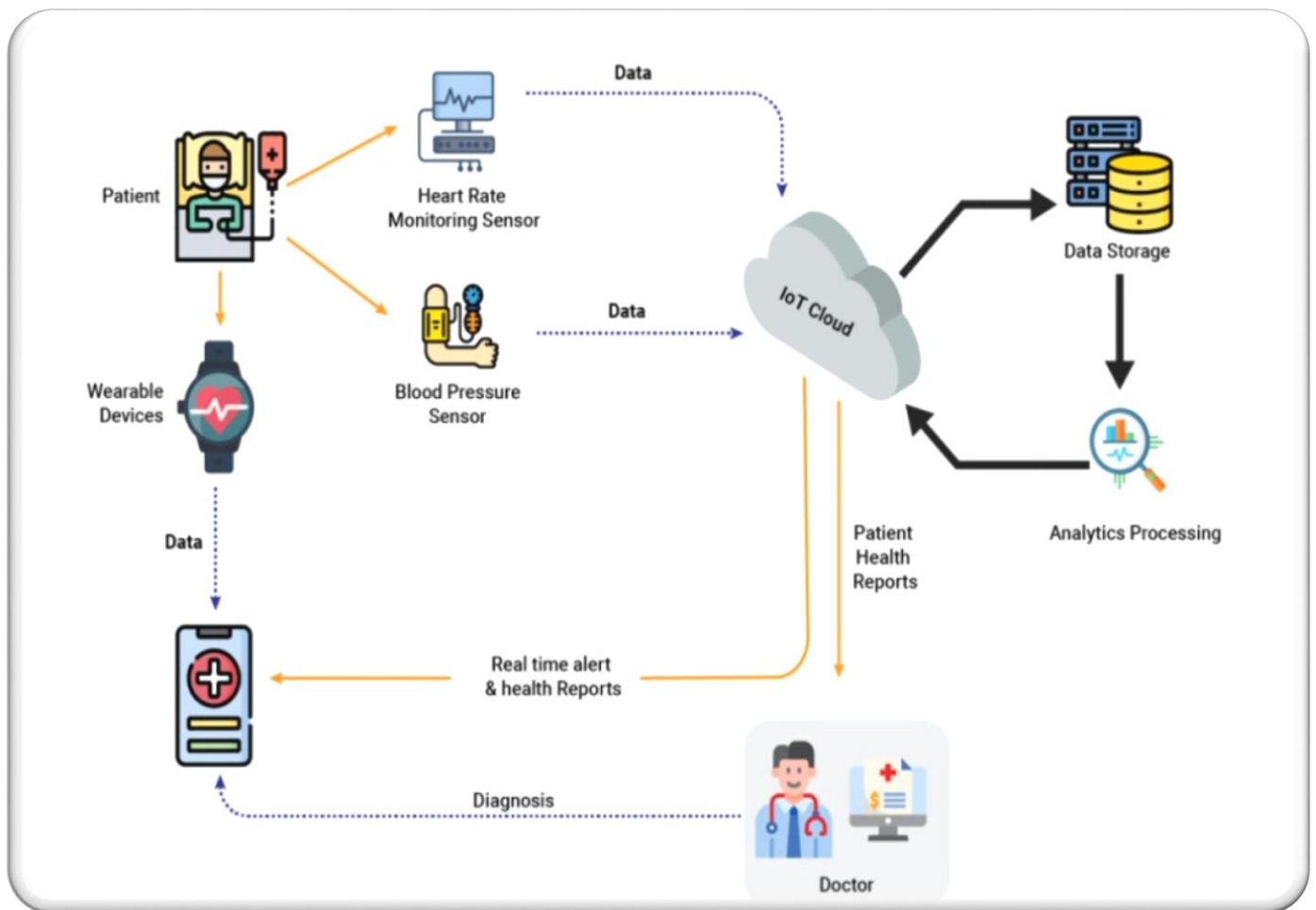
**f. Challenges and Considerations:**

Ethical Concerns: IoB raises ethical questions related to data ownership, consent, and the responsible use of personal information.

Interoperability: Ensuring seamless integration between various devices and systems is crucial for the success of IoB in healthcare.

Regulatory Compliance: Adherence to healthcare regulations and standards is essential to safeguard patient information and maintain legal compliance.\

By leveraging IoB in healthcare, providers can offer more personalized and efficient care, leading to better patient outcomes and overall healthcare system improvements. However, careful attention to privacy, security, and ethical considerations is paramount in implementing IoB solutions in healthcare.



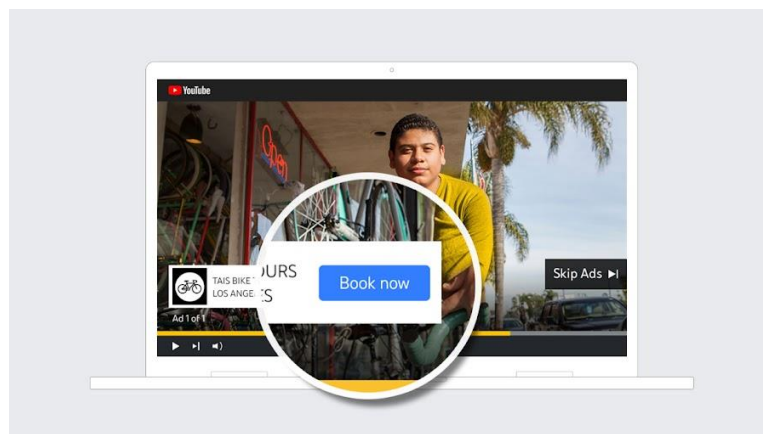


## 5. Applications

Due to IoB's ability to generate insights for individuals, it can be used in many applications that provide very specific and personalized support to users. A few of them are discussed below.

### a. Digital Marketing and Advertising/ Social Media

Based on customer interactions with specific products, marketing agencies and organizations can personalize advertisements so that **every individual sees what piques their interests the most**. For example, if a sensor or a device understands that a person spends more time at the gym, then he would get advertisements about brands that sell protein supplements, gym trainers, equipment, etc. If a person focussed on training a specific muscle all the time, the wearable could essentially advise him to shift his focus and train other body parts as well. Noticed how Google or YouTube advertises products you had searched for within the last hour or discussed with your friends? Yup, connected devices making use of IoB.



### b. Healthcare

A large number of the world's population currently suffer from chronic illnesses. Healthcare providers can monitor their patients' behaviour in real-time. From understanding how to react to certain medications to keep a tab on their regimens, physicians can now do everything with the help of *Internet of behaviours*. What's more,

these devices can be trained to give out insights based on user activities so that the healthcare providers can easily form diagnoses.



### c. Government/Polycymaking

The government can use the data generated by IoB devices to track the activities of persons of interest and avoid mishaps from taking place. The government can also undertake surveys to understand what the citizens are collectively interested in and track behavioural patterns of large groups to maintain law and order. Of course, there is an element of over-regulation but a committee to monitor such activities could also be set up to uphold the privacy of citizens.

### d. Insurance

In sectors like vehicle insurance, the insurance companies could monitor the activities of drivers using IoB to gauge their roles in accidents so that insurance companies can correctly identify whose fault the mishap was. These devices could also play a role in preventing driving under influence or **even identify medical emergencies**.

These are only a few of the areas where IoB's use has been prevalent. Other areas include defense, facial recognition, geolocation-based activity reminders, and predictions, finance management, efficiency and productivity, cutting costs, and industrial automation among others.

#### **e. Location Tracking**

Tracking users' locations for sending notifications based on this information became usual for many businesses. Moreover, you can get a request from the restaurant just after reviewing this place. Such services use GPS or near-field communication (NFC) techniques. It ensures accurate location tracking for personalized notifications or emails.

#### **f. Travel Recommendations**

Another significant influence of IoT and IoB was on the travel industry. Booking applications can learn from searching history and other indexes, such as demographic or social status. It allows the most fitted travel recommendation for the clients.

#### **g. Security and Surveillance**

IoB can contribute to enhanced security by monitoring and analyzing behaviour in public spaces. This includes identifying suspicious activities, crowd behaviour analysis, and enhancing overall security measures.

#### **h. Smart Cities and Transportation**

IoB can contribute to the development of smart cities by analyzing traffic patterns, public transportation usage, and pedestrian movements. This information can be used to optimize traffic flow, improve public transportation systems, and enhance overall urban planning.

#### **i. ecommerce**

The internet of behaviours is significantly impacting the world of ecommerce. The IoB takes advantage of data collection from user behaviours and interactions with websites, automatically categorizing customers based on their habits and preferences. This data is then used to create personalized experiences for each customer, such as customized product recommendations and highly relevant content on web pages. As a result, businesses are better equipped to understand the needs of their consumers and develop ways to meet them efficiently.

## 6. Technologies

The Internet of Behaviour (IoB) relies on a combination of technologies to collect, analyze, and interpret data related to human behaviour. Some of the key technologies involved in implementing IoB applications include:

### a. Sensors and IoT Devices

Various types of sensors, such as motion sensors, accelerometers, GPS, biometric sensors, and environmental sensors, are used to collect data on physical activities, location, and environmental conditions.

### b. Wearable Devices

Smart watches, fitness trackers, and other wearable devices are equipped with sensors to monitor and collect data on users' activities, health metrics, and behaviours.

### c. Biometric Technology

Biometric sensors, such as fingerprint scanners, facial recognition cameras, and voice recognition systems, are used to capture and analyze unique biological and behavioural characteristics for authentication and identification.

### d. Machine Learning and AI

Advanced algorithms, machine learning, and artificial intelligence (AI) are crucial for analyzing and interpreting the vast amount of data generated by IoB applications. These technologies help derive meaningful insights, detect patterns, and make predictions based on behavioural data.

### e. Big Data Analytics

IoB involves the processing of large volumes of data in real-time. Big data analytics tools and platforms are used to handle, store, and analyze the massive datasets generated by IoB devices and sensors.

#### **f. Edge Computing**

Edge computing brings computational processing closer to the data source, reducing latency and improving real-time analysis. This is particularly important in IoB applications where timely insights into behaviour are crucial.

#### **g. Cloud Computing**

Cloud computing services are utilized for storing and processing IoB data on a larger scale. Cloud platforms offer scalability, accessibility, and the ability to handle extensive data storage and computing requirements.

#### **h. Communication Technologies**

High-speed and reliable communication technologies, such as 5G and Wi-Fi, play a vital role in transmitting data between IoB devices, sensors, and the central processing systems.

#### **i. Block chain**

Block chain technology can be applied to enhance the security and integrity of IoB data. It helps ensure the trustworthiness of the data and provides a transparent and decentralized way of managing information.

#### **j. Human-Computer Interaction (HCI)**

Technologies that facilitate interaction between humans and computers, such as natural language processing (NLP), gesture recognition, and virtual reality (VR), contribute to a more seamless and intuitive IoB experience.

#### **k. Cyber security Measures**

Given the sensitive nature of behavioural data, robust cyber security measures, including encryption, access controls, and secure communication protocols, are essential to protect privacy and prevent unauthorized access.

## 7. Advantages

The implementation of IoB comes with advantages. Some of the advantages of IoB include:

### **a. Improved Customer Experiences**

IoB can help businesses personalize their offerings and improve customer experiences, leading to increased customer loyalty and repeat business.

### **b. Process Optimization**

IoB can help businesses optimize their processes and improve efficiency, leading to cost savings and increased profitability.

### **c. Data-Driven Decision Making**

IoB provides businesses with access to real-time data, enabling them to make informed decisions and adapt to changing market conditions.

### **d. Market products more effectively to customers**

Many digital marketing agencies have already been using analytics tools to find insights that reveal common consumer behaviors. With the IoB, marketers are able to analyze customer buying habits across platforms, gain access to previously unattainable data and redefine the value chain, and even provide real-time point-of-sale notifications and targeted ads.

### **e. Enhance public health**

Companies in the manufacturing sector are already using sensors and RFID tags to determine if on-site employees are washing their hands regularly. Further, computer vision can determine if employees are complying with mask protocol or social distancing directives. And in the health industry, providers can measure the activation and engagement efforts made by patients.

**f. Improve public safety**

The monitoring of public safety is creating exciting new opportunities across industries. In one application , vehicle telematics is deployed to track driver behaviour and flagging behaviours that are erratic or dangerous.

## **8. Disadvantages**

Internet of Behaviour security is a critical issue. Nothing is 100% safe and so the internet of Behaviour is. There are chances of Data theft and personal information leaks , that may adversely affect the individuals. There are many disadvantages are available in a internet of behaviour:

### **a. Privacy concerns**

When companies collect vast amounts of customer data associated with their moods, their behaviour, likes, and dislikes, customers feel a threat to their privacy rights.

### **b. Cyber security**

The primary concern with the Internet of Behaviour remains the way data is collected and stored. The Internet of Behaviour provides a huge database for cybercriminals to take advantage of. A lot of confidential data regarding the customers may get compromised if it falls in the hands of unethical users. However, many companies and research organisations have begun addressing this issue. New cyber security protocols may come into existence that makes the use of Internet of Behaviour technologies safer.

### **c. Ethical Concerns**

There are ethical considerations around the collection of data about people's behaviours, particularly if the data is used in ways that could harm individuals or communities.

### **d. Cost and Resource Intensiveness**

Implementing IoB systems can be resource-intensive in terms of both financial costs and infrastructure requirements. Small businesses or less developed regions may face challenges in adopting such technologies.



### e. Job Displacement Concerns

As IoB technologies automate certain tasks and decision-making processes, there is concern about potential job displacement, particularly in industries where manual or routine tasks are being replaced by automated systems.

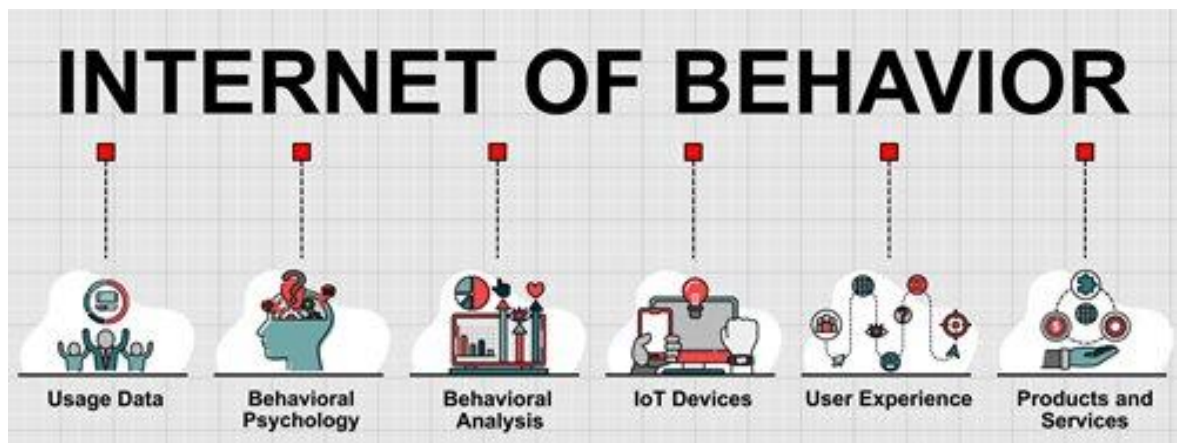
### f. Security Risks

IoB systems are vulnerable to security breaches and cyber attacks, which could compromise the integrity and confidentiality of the data collected. Malicious actors may exploit vulnerabilities in IoB devices or networks to gain unauthorized access to sensitive information or manipulate behavioural data for malicious purposes.



## 9. Importance of IOB

Gartner identified the IoB as a top trend in 2021 because of the potential value generated by tracking and understanding human behaviour with greater precision and accuracy. CRM ( Customer relationship management ) systems equipped with great analytics have already improved insight into buyer behaviour, and IoT medical devices have improved patient care. The IoB builds on these and other established systems by giving companies access to data and insight that was unavailable before the recent growth of IoT and data analytics.



The IoB is more than another form of analytics. IoB data and technology “can be used to influence behaviours through feedback loops.” Driving too fast? An IoB device can transmit data to a central system, or process the data through edge computing, to generate a warning for the driver to slow down. Crucially, with 5G and other networking technology, this warning can be generated in real time to immediately correct the driver’s behaviour.

IoB systems that influence employee behaviour can be used to impact purchasing behaviour. IoB can also be used by government organizations to influence their constituents. The importance of the Internet of Behaviour transcends traditional boundaries of business and government because human behaviour is a fundamental part of nearly everything that people do. This makes the IoB a transformational trend that can redefine humanity’s relationship with technology.

There is a need for IoB in healthcare to perform daily operations, including treatment planning, operations scheduling etc. IoB assists in determining the primary influencing aspects of a patient's behaviour. IoB also assists buyers in obtaining their desired services without wasting time navigating various purchasing methods for healthcare. Additionally, this technology can assist firms in developing goal-driven plans to delight clients and increase sales rates by analysing data. This innovation will fundamentally alter consumer purchasing behaviour and could revolutionise how goods are purchased. Many users are happy to share their personal information, even though some are hesitant to do so unless it adds value to their treatment services. Data from every aspect of a user's life may be gathered to improve performance and quality. This enables numerous touch points for the customer to interact with.

A large amount of data that can influence or drive patient behaviour are gathered through IoB. By examining online user behaviour, it seeks to comprehend user psychology. This framework can gather, examine, comprehend, and react to various human activities through machine learning algorithms. Many firms have been able to use online advertising to reach more clients by implementing IoB technologies. Businesses may quickly identify and target particular people or groups to offer their services and products using IoB. For instance, Google and Facebook use behavioural data to show their consumers relevant advertisements. With IoB, businesses may track customer behaviour to provide better services while connecting with potential customers.

## 10. Future

The development and use of IoB technology are rapidly evolving, with new trends emerging in the industry. AI-based solutions are becoming increasingly popular for automated behavioural analysis enabled by this technology. These solutions can help to identify patterns in user behaviour that would otherwise be difficult to detect manually. This could include identifying potential security threats or uncovering customer preferences and insights from large datasets. Wearable devices are also gaining traction as an alternative to traditional sensors for collecting behavioural data. They offer a more convenient way of gathering information about user activities without having to install additional hardware or software components on the device itself.

Interoperability standards are also being developed with increasing focus, allowing different platforms utilizing IoB technology to integrate seamlessly across different systems and networks. This will enable users to access data collected from multiple sources within one platform, providing a comprehensive view of their behaviours over time while maintaining privacy and security protocols throughout the process.

However, the collection of behavioural events data can be problematic. The IoB raises concerns about how businesses gather, navigate, and use data, particularly as more of it is collected. Whatever perspectives are on IoT and IoB, experts predict that they will continue to grow and influence in the near future.

According to Gartner, by the end of 2025, more than half of the world's population will be subject to at least one IoB program, whether from a commercial or governmental source. IoB, like other technology trends such as AI and machine learning, is likely to spark significant debate about the ethics vs. positive applications of this technology. According to these experts, by 2023, the individual activities of 40% of the global population will be tracked digitally to influence their behaviour through the IoB concept. In 2023, that percentage will represent more than 3 billion people worldwide (Gartner 2020).

As is the case with anything digital, there are always concerns about data falling into the wrong hands. With this increased use of behavioural data, the concern is that it could allow cybercriminals to take phishing scams to a whole new level. In addition to this, fears exist around the ethics of using technology to reward or punish certain behaviours.



## **11. Key features of iob**

This emerging technology can benefit companies in different ways. Following are some of the key features of IoB:

### **a. Marketing Products Effectively**

Internet of Things (IoT) generates a lot of data and information. When this information is processed by the Internet of Behaviors (IoB), it becomes easy to identify the platform's users interact with and analyze customers' buying habits. This data is used to implement effective marketing strategies for the customers, and targeted ads can be sent quickly.

### **b. Improve User Experience**

Companies can boost the overall product experience for customers by leveraging the detailed information gathered from the Internet of Behaviors (IoB). This can help them improve customer engagement.

### **c. Better Customer Service**

The more IoT devices people use, the more information can be gathered about them. Not only this data can help in providing better services but also quickly resolving issues faced by customers. By assisting in resolving problems quickly to close sales, companies try to keep their customers happy.

### **d. Driving More Traffic to Websites**

With the emergence of the Internet of Behaviors (IoB), an improved version of SEO, Search Experience Optimization (SXO), has been developed to increase website traffic and market product and services better.

## 12. Component of iob

The Internet of Behaviours (IoB) involves a diverse set of components working together to collect, process, and utilize behavioural data. Below are some key components that play a crucial role in the IoB ecosystem:

### **a. Sensors and Devices:**

**Wearable Devices:** Smartwatches, fitness trackers, and other wearables equipped with sensors to monitor physiological and activity-related behaviour.

**Smartphones and Smart Devices:** Devices with built-in sensors, including accelerometers, gyroscopes, GPS, and cameras, capturing various aspects of user behaviour.

### **b. IoT Devices:**

**Connected Appliances and Gadgets:** Devices in the Internet of Things ecosystem, such as smart home devices, connected cars, and industrial IoT devices, contribute to behavioural data collection.

### **c. Biometric Sensors:**

**Heart Rate Monitors:** Devices measuring heart rate and other cardiovascular metrics.

**Facial Recognition Cameras:** Cameras equipped with facial recognition technology for analyzing facial expressions and behaviours.

**Voice Recognition Systems:** Systems capturing and analyzing voice patterns and speech-related behaviour.

### **d. Connectivity Infrastructure:**

**IoT Networks:** Networks specifically designed for IoT communication, such as Low-Power Wide-Area Networks (LPWAN), Zigbee, or Thread.

**Edge Computing:** Edge computing infrastructure for processing data closer to the source, reducing latency and optimizing bandwidth.

#### **e. Data Processing Engines:**

Stream Processing Frameworks: Technologies like Apache Kafka, Apache Flink, or Spark Streaming for real-time data processing.

Batch Processing Systems: Systems like Apache Spark for analyzing historical data in batch mode.

#### **f. Data Storage:**

Databases and Data Lakes: Storage solutions for housing processed behavioural data, including both structured and unstructured formats.

Cloud Storage: Platforms like Amazon S3, Azure Blob Storage, or Google Cloud Storage for scalable and accessible data storage.

#### **g. Analytics and Machine Learning:**

Behavioural Analytics Platforms: Specialized platforms for analyzing patterns and deriving insights from behavioural data.

Machine Learning Algorithms: Algorithms for predicting and understanding behaviour based on historical data.

#### **h. Decision-Making Engines:**

Rules Engines: Systems for defining and applying rules based on behavioral insights.

Real-Time Decision-Making Systems: Components that enable immediate responses to changing behaviour patterns.

#### **i. Feedback and Intervention Mechanisms:**

User Feedback Systems: Interfaces and dashboards providing feedback, recommendations, or alerts to end-users.

Automated Intervention Systems: Systems that automate responses or interventions based on predefined criteria.



#### **j. Security and Privacy Measures:**

Encryption Technologies: Measures to secure data through encryption during transmission and storage.

User Authentication Systems: Mechanisms to ensure that only authorized individuals have access to sensitive behavioural data.

#### **k. User Interfaces:**

Dashboards and Applications: Interfaces that allow end-users or administrators to interact with and understand the behavioural insights.

APIs and Integration Points: Interfaces enabling integration with external systems and applications.

#### **l. Continuous Improvement Mechanisms:**

Feedback Loops: Systems for capturing outcomes of interventions and actions to improve behavioural models and decision-making algorithms over time.

Monitoring and Analytics for System Performance: Components that monitor the performance of the IoB system itself.

These components work together to create a comprehensive IoB ecosystem, addressing various aspects of data collection, processing, analysis, and response. It's important to note that the specific components may vary based on the application domain and the goals of the IoB system. Additionally, adherence to ethical guidelines, privacy regulations, and user consent is paramount in the design and deployment of IoB solutions.



## 13. Conclusion

Internet of behaviour technology is applied at various places to understand the consumers' activities and upgrade businesses. This technology is still improving and getting better. If used properly, this technology can understand each consumer in a better way and help not just private businesses but also the governments to improve public services.

Today, several fortune companies are taking the help of the internet of things and the internet of behaviour technology to understand their customers and their needs in a better way.

Since IoB and IoT are interlinked with each other, the development of both is being done at the same pace. In the coming years, IoB will act as an ecosystem, that will be responsible for defining the behaviour of humans in the modern world.

But despite many advantages of using IoB, this technology will be responsible for raising several questions related to the privacy and security of the person. Therefore, companies need to set up awareness programs to educate stakeholders about cyber security for the IoB technology.

Internet of behaviour is still in the nascent stage and has immense potential and possibilities in turning into more than just an algorithm to collect information.

IoT helps convert data into useful information, but IoB helps convert that information into real knowledge.

## 14. References

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