J.B INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC AUTONOMOUS)

DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING

TECH HON

TECHNICAL MAGAZINE
JUNE 2021

About JBIET

As one of the top ten most preferred institutions in Telangana, JBIET continues to strive to impart technical (engineering) and professional education of very high standards.

The aim of JBIET is to mould young learners into globally competitive professionals who are professionally deft, intellectually adept and socially responsible.

The expert faculty at JBIET inculcate the best values and principles, ascribing to a modern curriculum; while the students imbibe pragmatic perception and a pro-active nature, which spurs them towards exploration and advanced inquiry, resulting in valuable insights.

The Placement record of JBIET over the years is proof of our right efforts in enabling the best in class engineering, technical and professional education to aspirants.

Vision of the College

To be a center of excellence in engineering and management education, research and application of knowledge, to benefit society with blend of ethical values and global perception.

Mission of the College

- To provide world class engineering education, encourage research and development.
- To evolve innovative applications of technology and develop entrepreneurship.
- To mould the students into socially responsible and capable leaders.

About the Department

- Established in 1998 with B. Tech CSE with intake 60
- M.Tech CSE Started in 2005 with intake of 18
- Present intake B. Tech CSE 120 M. Tech CSE 18
- Total Faculty 31 Non-Teaching :8
- No of labs :10
- Dept. Library
- No of MOU'S with industry :6
- Good Placement Record& Higher Education
- R&D and Project Labs
- Professional Chapters
- Good Teaching and Learning process
- Good Student Supporting System

Vision of the Department

To meet the emerging trends in computer Science and Engineering, strive for self-reliance enabled through high end research by adapting a futuristic approach.

Mission of the Department

M1: To impart qualitative education, prepare students refurbish their latent talents and aspire for a pragmatic career in Computer Science and Engineering

M2: To provide an ambiance to develop strategic areas of advance study with perception to foster industry centric education in computer science and Engineering.

M3: To inculcate self-learning among students to make them self-reliant and socially responsible.

Program Outcomes (POs)

PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	**Design / Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO5	**Modern Tool Usage**: Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice.
PO7	**Environment and Sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO9	**Individual and Teamwork**: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance**: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change. Any signatory needs to provide an overview of its learning outcomes and confirm that compliance of programs.

Program Educational Objectives (PEOs)

Program outcomes are narrower statements that describe what students are expected to know and be able to do upon the graduation. They are formed in line with the graduate attributes of NAAC. These relate to the Skills, knowledge, attitudes, values and behavior outcomes that students acquire through the program.

PEO1	To Prepare graduates to apply the knowledge and skills acquired in Mathematics, Basic Science and Engineering to succeed in their career, pursue research and or obtain higher/advanced degree.
PEO2	To prepare graduates to learn emerging technologies, work in multidisciplinary fields , apply computer engineering solutions within a global ,societal, environmental context, acquire leadership qualities and enable them to become successful entrepreneurs.
PEO3	To prepare graduates communicate effectively, exhibit professionalism with integrity, morals, ethical conduct and engage in lifelong learning.

Program Specific Outcomes (PSOs)

PSO 1	Ability to design and develop computing system using mathematical knowledge and expertise other disciplines.
PSO 2	Ability to test and analyse quality of various systems to integrate them in larger computer systems.

Chairman's Message

In my position as the Chairman of all the J.B. Group of Educational Societies and all the J.B. Group of Educational Institutions, I convey my bestwishes to all our relentlessly advancing institutions nestled in a sprawling woody campus of about 106 acres of land, on the main road at Yenkapally, Moinabad Mandal, and R.R. District. The efficacy of the group can be witnessed from the establishment of three Engineering Colleges; J.B. Institute of Engineering &Technology.Joginpally.B.R. Engineering College; and Bhaskar Engineering College, besides the manifestation of Bhaskar Medical College and Bhaskar General Hospital. My lifetime ambition and objective being the provision of education, from KG to PG, to the underprivileged students of rural background, we have been providing free education, up to High School level in English Medium, to the poverty- stricken destitute of our countryside. We established J.B. Institute of Computer Technology during 1996-97 with PG Courses in MCA and MBA, in the vicinity of Lord Balaji's abode, Tirupathi, as well. The management started two new Womens Engineering Colleges at Hyderabad and Tirupathi from the academic year 2008-09. The management encourages the youth of this state to find their careers in the noble profession of medical practitioner, by imparting quality medical education, and help our people lead healthy lives.

The World since recent times had been moving amazingly fast and fiercely competitive in all spheres of human activity. The said situation called for massive expansion of career focused education, particularly in Engineering, Management and such other professional areas. As a result, there had been mushroom growth of Institutions at a phenomenal level in the private sector. However; it is unfortunate to observe that the quality of education started eroding. The urgent need of the times was to lay emphasis on quality education and to strive vigorously for global excellence and acceptability.

It is exactly at this critical juncture of time i.e. in the year 1993, J.B. Educational Society was established to serve the cause of the spread of general, Professional and Engineering education by a team of enlightened persons, under my Chairmanship.

The J.B. Group of Educational Societies has been maintaining an excellent academic track record for more than a decade. The J. Institute of Engineering & Technology (1998), Bhaskar Engineering College and Bhaskar Pharmacy College(2007) were established by J.B.EducationalSociety.Joginpally B.R. Engineering College (2002), Bhaskar Medical College (2005) and Joginpally B.R.Pharmacy College (2007),were established under the banner of Joginpally B.R.Educational Society.

J.B.I.E.T. has well developed infrastructural facilities, such as adequate built up area, well equipped laboratories, libraries and information centers with digitalization and automation and on line transaction facilities in the campus. All facilities such as Medical, Transport, Canteen and Games & Sports, are available besides Seminar Halls, Conference Halls, Indoor Auditorium, Open-Air Theatre, Post Office and Banking.

We have encompassed Jawaharlal Knowledge Centre at J.B.I.E.T and J.B.R.E.C. to empower students to acquire Interactive Communication skills, Technical and employable skills to compete in the Global job market. The policy of this Management is to impart quality education and train the students and for the accomplishment of the same, we have recruited resourceful faculty that are dynamic dedicated and committed to the goal oriented efficient teaching with effective methodology. We have recruited seven Professors with Ph.D. Degrees to hold the posts of HODs of the respective seven branches, apart from the principal with vast experience in the field.

J.B.I.E.T., being an NBA accredited institution and the winner of the status of JNTUs Permanent Affiliation, is one of the best 10 Engineering Colleges of the state, and also is the most preferred institution for aspiring students and their parents. The enrollment of students in JBIET has crossed the 3000 mark and went even higher in the academic year 2008-09.

The institute has launched a host of Faculty and Staff Development Programs, R&D, and Industry and other external project consultancy activities. We have taken up faculty, staff and students Welfare and other HRD measures.

I have great pleasure in conveying the tiding that we have submitted proposals to the U.G.C. authorities for grant of Deemed to be UniversityStatus, for which the Government of Telangana and JNTU were pleased to issue No Objection Certificates. We are expecting that the said grant will be accorded in 2009.

National Seminars and Conferences are being organized frequently at our M.N. Rao Auditorium (air conditioned). Experts from Academia and Industry are invited to address and interact with the students. The Management has been sponsoring the deserving students and faculty to present technical papers and participate in the International Conferences in India and abroad. The Management has taken all possible measures for the career development and placement of all the qualified students domestically and globally.

NBA team of experts have visited and inspected J.B.R.E.C. on 20th & 21st February, 2009 to consider for the grant of Accreditation of four U.G. programs offered at the College.

We are fortunate to have the three renowned Academic Administrators, eminent scholars and the former illustrated Vice Chancellors of Osmania University and JNTU on the panel of Governing Bodies and the Advisory Bodies of J.B. Group of Educational Institutions, who extend their precious advice, and expert guidance, from time to time to formulate strategies in the cause of holistic development of the students.

On the eve of the Annual Day celebrations of JBIET, Bhaskar Engineering College, Bhaskar Pharmacy College, Joginpally B.R.Engineering College, Joginpally B.R. Pharmacy College, this year, we organized Spoorti-2009

(A Techno Cultural Fete) in the most befitting manner.

I have immense pleasure to welcome and congratulate all the Principals, Faculty, Staff and Students of all the colleges housed in the Campus for their laudable efforts in organizing Infoquest-2009 and Inxs-2009, studded with several student centric activities, spanning over three consecutive days i.e. on 26th, 27th and 28th February, 2009 and also for bringing out a souvenir 'Spoorti-2009' to commemorate the events.

J.V. KRISHNA RAO
MBA HR - USA

Secretary Message

"Education is the passport to the future, for tomorrow belongs to those who prepare for it today".

JB Institute of Engineering & Technology was established in the year 1997 under the umbrella of JB Group of Educational Institutions, Hyderabad. At present JBIET is a UGC Autonomous Institution and permanently affiliated to JNTU Hyderabad.

The Speedy development in the field of Information & Technology has accelerated the demand for the value based education in the stream of Engineering, Technology and Management which is qualitative, progressive and multidimensional in competitive global environment. We provide quality education beyond the four walls of classroom to cope up with the corporate world.

The aim of JBIET is not only to produce mere degree holders, but the bright, talented men and women equipped with all round development of personality. Our vision of the institute is to impart quality education with Life Skills in all core disciplines of knowledge by developing global leaders who are passionate, committed and confident to take initiative in the nation building and create a peaceful environment for WORK, WORKER AND WORKPLACE.

CEO Message

I welcome you all to the portals of J.B. Institute of Engineering and Technology (JBIET) a Great Institution by all standards. Engineering continues to be a lucrative career for the bright minds, as it is only through engineers that the inventions of science can reach the masses, for the overall development and welfare of the society. With numerous developmentprojects being executed and planned within the country and outside, engineers have a bright future. And at JBIET, we ensure that it happens.

JBIET has been one of the best engineering colleges in the two states of Telangana and Andhra Pradesh. It has been striving hard to not only maintain its standards but also to continuously improving them, so as to benefit the students in particular and the society at large. The college boasts of well qualified and self-motivated faculty who have rich experience inacademics, industry and research. They are backed up by experts from the industry. The curriculum is regularly revised to keep pace with the industry requirements, so that the students pass out as industry-ready graduates.The institute has excellent infrastructure, laboratories and workshops. The calm and quiet environment in the lush green campus, away from the hustle-bustle of the city, provides a tranquil environment, so conducive to quality Teaching Learning.

In today's age, everyone is aware that besides class room studies, colleges should Concentrate on overall development of students by laying adequate attention on co-curricular and extra-curricular activities. At JBIET, we are very focused about the same and ensure that all students are put through "Life Skills and Employability Skills Training" right from the first semester itself. The JB Educational Group of Institutions has Architecture, Pharmacy, Law, Medical and Dental Colleges, all co-located within the same campus, along with JBIET. This provides to students the much needed inter- disciplinary teaching-learning environment, which is otherwise not available in many stand-alone colleges.

The college not only inculcates a Creative and Innovation Spirit in the minds of our Students but also actively encourages them through the Group's JB Institute of Inventors Association of India (JBIIAI). This body provides intellectual support, logistics support and financial support, right from ideation to commercialization.

We hand-hold the students right throughand ensure that they become Job-providers rather than Job-Seekers. It will be the sincere endeavor of JBIET to turn you into knowledgeable Graduates / Postgraduates by guiding you and moving along with you during your studies at the institute. I would like to wish you all a studious, satisfying and enjoyable journey in this institute. Along with your parents/ guardians, we at the institute, will be looking forward eagerly and confidently to your bright success; so does the society and the nation. Remember what Swami Vivekananda said "Arise, Awake and Stop not, till the goal is reached".

Looking forward to moving along with you in your beautiful journey ahead. Come, join us!
Wishing you All the Best!

Dr. P. C. Krishnamachary

MTech , Ph.D

Principal's Message

"Change is the end result of all true learning"
Welcome to the vibrant world of JB Institute of Engineering and Technology, Hyderabad, I on behalf of all the faculties and staff, congratulate you for choosing JBIET to reach the life goal. This Institute established in the year 1998 under the aegis of JB Group of Educational Institution's. JBGEI is the brain child of our visionary leader and founder chairman Late Sri. J. Bhaskar Rao Garu. In Consonance with the needs of time and to cope upwith the dynamic changes in the era of technology dominant world.

At JBIET we the team are continuously working on to fulfil the local, regional, national and global aspirations of the youth of Telangana and Andhra in particular and India at large for providing the world class technical education to benefit all the sections of the society. In the current context of rapidly changing Socio-Economic Scenario, DemographicDividend of India playing a major role in performing unexpected results. We go beyond the normal education system at our campus. The overall holistic development of the budding professional / technocrats of JBIETians with value addition education systems with Employability and Life Skills, Techno Sessions, Cultural Fest, Technical Fest, QUIZ, Guest Lectures, Industry Institute Interactions and the most important is the curriculum design in consult with Industry and university is extending full support to empower our institution. Our Institute is committed to maintain an academically rich and professionally compete tent environment by encouraging the enterprising skills of our students. Our institute has consistently produced excellent results and its alumni are making their Mark in distinguished organizations in India and overseas. We are constantly making efforts to ensure that our students showcase their academic talent with high moral values and make responsible citizens of the society and humanity.
I am confident that we as an Institute will grow and contribute positively and actively in transforming the society. With warm wishes.

Dr.P.C. Krishnamachary

Principal, JBIET.

Constitution of Editorial Board:

Editor and Editorial Board, for the publication of Technical Magazines, Newsletters is appointed by the HOD. The student representatives in this publication are also decided by the HOD.Technical Magazine and News Letters covers of followingitems:

- News about latest Technical inventions and innovations.
- Technical activities and achievements in the Department.
- Articles from Department Faculty and Students related to various areas of interest.
- Details about Seminars, Workshops, Conferences at JBIET.
- Achievements of the students & faculty.

Process of Publishing:

- Editor with the help of the Editorial Board collects the news items related to CSE from various Magazines, Newspapers and Professional Societies and also calls for the articles publications from students and faculty giving a fixed target time.
- These articles are screened by Editorial Committee for publication into Magazines/Newsletter.
- Technical activities and achievements in the Department are collected based on the information available to HOD.
- Sometimes, special issues are planed based on the current topics and new technological trends.
- Details about Seminars, Workshops, and Conferences at JBIET are collected from IQAC.
- After collection, a basic draft is created and submitted to advisory board for proof reading. Later, this content is formatted on publishing software like Microsoft Publisher, Scribus etc.
- Frequency of Publishing Magazine Once in a Year and News Letters is Twice in a Year.

Process of Dissemination:

- E-copy of the Newsletter/Magazines are disseminated through JBIET Website. Printed copies of the same are available in the Department and Central library.

Ensuring Students Participations

- Students are encouraged to write articles and submit news items.
- Students get recognition and appreciation for their articles published by them, among their Cohorts.
- Student's achievements are also published to keep them motivated.
- Student's representation is also made in the editorial board.

Board of Editors

Chief Editor:

Dr. P. Srinivasa Rao, Professor, HOD, Dept. of CSE

Associate Editor:

Dr. Niraj Upadhayaya, Professor, Dept. of CSE

Faculty Coordinators:

Dr. G. Appa Rao Naidu, Professor, Dept. of CSE

Technical Support:

Mr. D.Himagiri Asst. prof., Dept. of CSE

Mr. K. Srikanth, Asst.prof., Dept. of CSE

Student Coordinators:

Mr. H.Nandha Kumar,IV B.Tech,CSE Dept.

Ms. Aditi. S.D. IV B. Tech, CSE Dept.

Cover page Design:

M.Deepak, II B.Tech, CSE Dept.

1.Internet of Things (IoT)

The Internet of Things (IoT) describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. These devices range from ordinary household objects to sophisticated industrial tools.
With more than 7 billion connected IoT devices today, experts are expecting this number to grow to 10 billion by 2020 and 22 billion by 2025. Oracle has a network of device partners.

Importance of Internet of Things (IoT)

Over the past few years, IoT has become one of the most important technologies of the 21st century. Now that we can connect everyday objects—kitchen appliances, cars, thermostats, baby monitors—to the internet via embedded devices, seamless communication is possible between people, processes, and things.

By means of low-cost computing, the cloud, big data, analytics, and mobile technologies, physical things can share and collect data with minimal human intervention. In this hyper connected world, digital systems can record, monitor, and adjust each interaction between connected things. The physical world meets the digital world—and they cooperate.

Technologies That made IoT possible

While the idea of IoT has been in existence for a long time, a collection of recent advances in a number of different technologies has made it practical.

Access to low-cost, low-power sensor technology. Affordable and reliable sensors are making IoT technology possible for more manufacturers.

Connectivity. A host of network protocols for the internet has made it easy to connect sensors to the cloud and to other "things" for efficient data transfer.

Cloud computing platforms. The increase in the availability of cloud platforms enables both businesses and consumers to access the infrastructure they need to scale up without actually having to manage it all.

Machine learning and analytics. With advances in machine learning and analytics, along with access to varied and vast amounts of data stored in the cloud, businesses can gather insights faster and more easily. The emergence of these allied technologies continues to push the boundaries of IoT and the data produced by IoT also feeds these technologies.

Conversational artificial intelligence (AI). Advances in neural networks have brought natural-language processing (NLP) to IoT devices (such as digital personal assistants Alexa, Cortana, and Siri) and made them appealing, affordable, and viable for home use.

Industrial IoT

Industrial IoT (IIoT) refers to the application of IoT technology in industrial settings, especially with respect to instrumentation and control of sensors and devices that engage cloud technologies. Refer to thisTitan use case PDF for a good example of IIoT. Recently, industries have used machine-to-machine communication (M2M) to achieve wireless automation and control. But with the emergence of cloud and allied technologies (such as analytics and machine learning), industries can achieve a new automation layer and with it create new revenue and business models. IoT is sometimes called the fourth wave of the industrial revolution, or Industry 4.0.
The following are some common uses for IIoT:

- Smart manufacturing
- Connected assets and preventive and predictive maintenance
- Smart power grids
- Smart cities
- Connected logistics

IoT applications

Creating better enterprise solutions
Integrating smarter homes
Innovating agriculture
Upgrading supply chain management
Transforming healthcare

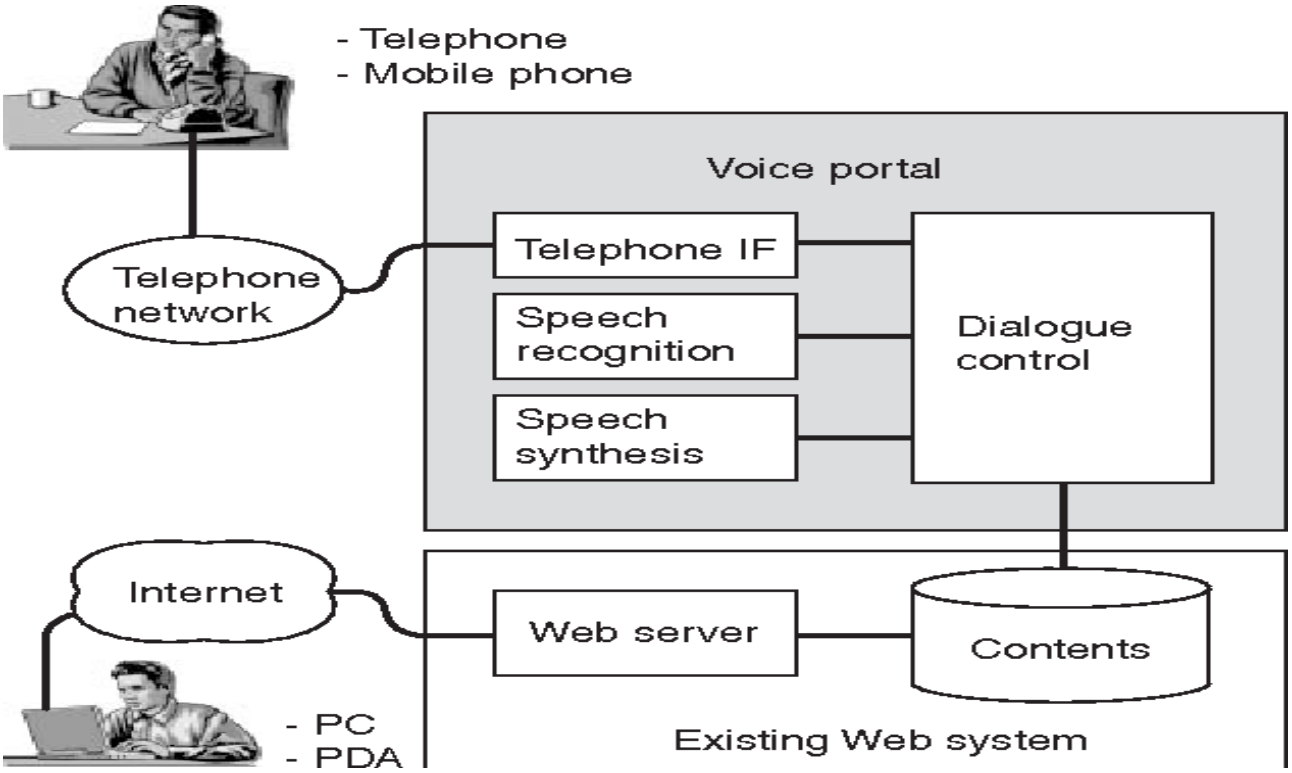
Dr.P. Srinivasa Rao M.Tech., Ph.D
Professor, HOD, CSE
Dean of P.G Studies

2.Voice Portals

Introduction

Voice portals are the voice equivalent of web portals, giving access to information through spoken commands and voice responses. Ideally a voice portal could be an access point for any type of information, services, or transactions found on the Internet.

Common uses include movie time listings and stock trading. In telecommunications circles, voice portals may be referred to as interactive voice response (IVR) systems, but this term also includes DTMF services. With the emergence of conversational assistants such as Apple's Siri, Amazon Alexa, Google Assistant, Microsoft Cortana, and Samsung's Bixby, Voice Portals can now be accessed through mobile devices and Far Field voice smart speakers such as the Amazon Echo and Google Home.



Advantages

Voice portals have no dependency on the access device; even low end mobile handsets can access the service. Voice portals talk to users in their local language and there is reduced customer learning required for using voice services compared to Internet/SMS based services.

A complex search query that otherwise would take multiple widgets (drop down, check box, text box filling), can easily and effortlessly be formulated by anyone who can speak without needing to be familiar with any visual interfaces. For instance, one can say, "Find me an eyeliner, not too thick, dark brown, from Estee Lauder MAC, that's below thirty dollars".

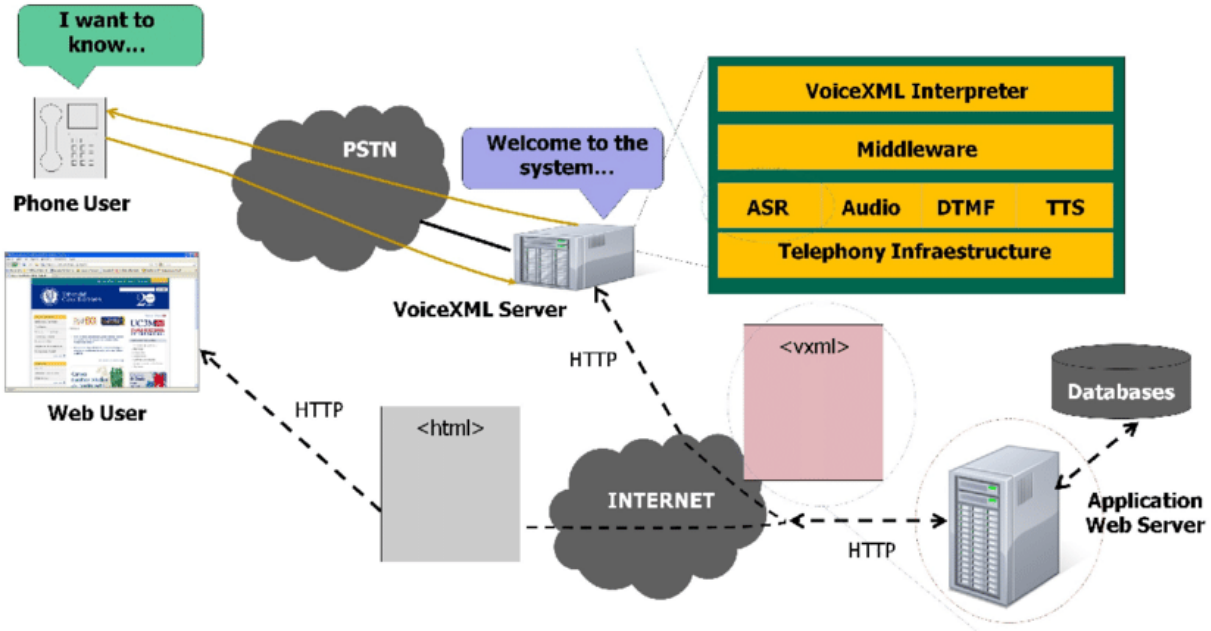
Trends

Live-agent and Internet-based voice portals are converging, and the range of information they can provide is expanding.

Live-agent portals are introducing greater automation through speech recognition and text-to-speech technology, in many cases providing fully automated service, while automated Internet-based portals are adding operator fallback in premium services.

The live-agent portals, which used to rely entirely on pre-structured databases holding specific types of information are expanding into more free-form Internet access, while the Internet-based portals are adding pre-structured content to improve automation of the more common types of request.

Speech technology is starting to introduce Artificial Intelligence concepts that make it practical to recognize a much broader range of utterances, learning from experience. This promises to make it practical to greatly improve speaker recognition rates and expand the range of information that can be provided by a voice portal.



Technology Providers

A number of web-based companies are dedicated to providing voice-based access to Internet information to consumers. Quack.com launched its service and has obtained the first overall voice portal patent. Quack.com was acquired by AOL . Tellme Networks was acquired by Microsoft .

Nuance, the dominant provider of speech recognition and text-to-speech technology, is starting to deliver voice portal solutions

Apart from public voice portal services, a number of technology companies, including Alcatel-Lucent, Avaya, and Cisco, offer commercial enterprise-grade voice portal products to be used by companies to serve their clients. Avaya also has a carrier-grade portfolio.

Dr.Niraj Upadhayaya, M.Tech,Ph.D

Professor , CSE Dept.

3.Futex

Introduction

In computing, a **futex** (short for "fast userspace mutex") is a kernel system call that programmers can use to implement basic locking, or as a building block for higher-level locking abstractions such as semaphores and POSIX mutexes or condition variables.

A futex consists of a kernel-space *wait queue* that is attached to an atomic integer in user space. Multiple processes or threads operate on the integer entirely in userspace (using atomic operations to avoid interfering with one another), and only resort to relatively expensive system calls to request operations on the wait queue (for example to wake up waiting processes, or to put the current process on the wait queue).

A properly programmed futex-based lock will not use system calls except when the lock has contended; since most operations do not require arbitration between processes, this will not happen in most cases.

Operations

Futexes have two basic operations, `WAIT` and `WAKE`.

- `WAIT(addr, val)`

  If the value stored at the address `addr` is `val`, puts the current thread to sleep.

  - `WAKE(addr, num)`

    Wakes up `num` number of threads waiting on the address `addr`.

    For more advanced uses, there are a number of other operations, the most used being `REQUEUE` and `WAKE_OP`, which both function as more generic `WAKE` operations. `CMP_REQUEUE(old_addr, new_addr, num_wake, num_move, val)`

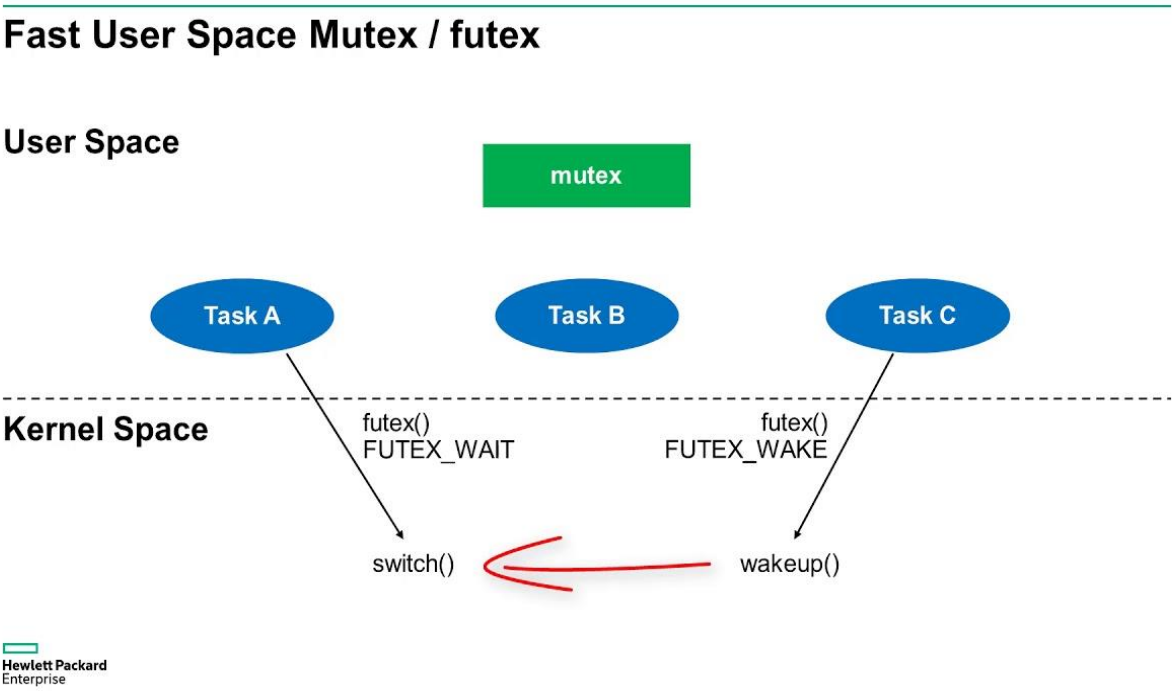
    If the value stored at the address `old_addr` is `val`, wakes `num_wake` threads waiting on the address `old_addr`, and enqueues `num_move` threads waiting on the address `old_addr` to now wait on the address `new_addr`. This can be used to avoid the thundering herd problem on wake.[12][13]

    - `WAKE_OP(addr1, addr2, num1, num2, op, op_arg, cmp, cmp_arg)`

    Will read `addr2`, perform `op` with `op_arg` on it, and storing the result back to `addr2`. Then it will wake `num1` threads waiting on `addr1`, and, if the previously read value from `addr2` matches `cmp_arg` using comparison `cmp`, will wake `num2` threads waiting on `addr2`. This very flexible and generic wake mechanism is useful for implementing many synchronization primitives.

Futex Versus Mutex

Mutual exclusion (mutex) algorithms are used to prevent processes simultaneously using a common resource. A fast user-space mutex (futex) is a tool that allows a user-space thread to claim a mutex without requiring a context switch to kernel space, provided the mutex is not already held by another thread.



Dr. SashiKala Damodaran MTech, Ph.D
Professor, CSE Dept.

4.Datafication

Datafication is a buzzword of the last several years, that is used actively along Big Data industry.

Definition

Datafication is the process of transforming data into actionable insights that drive business decisions.

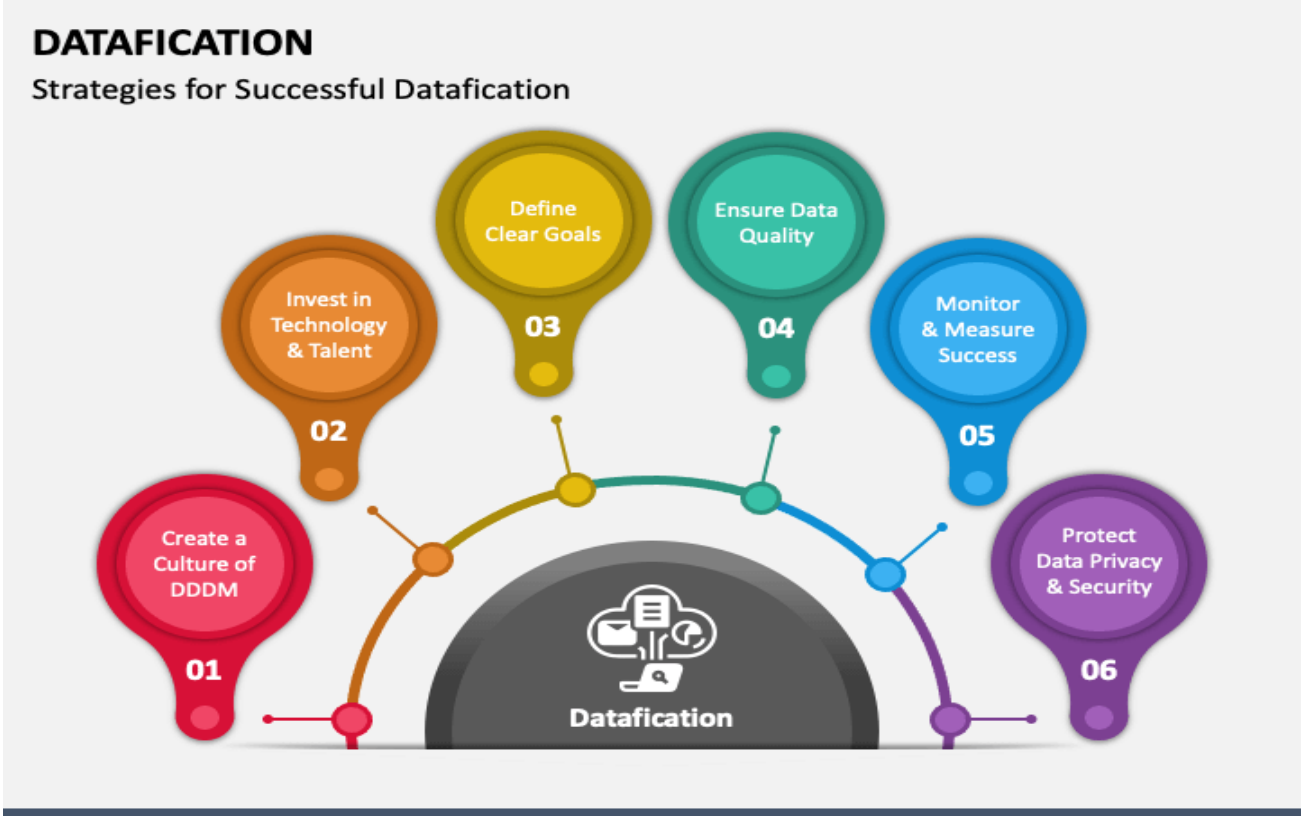
Datafication aims to take raw data and turn it into information,that businesses can use to make better decisions and improve their operations. This involves a combination of data management, analytics and data visualization.

Summarizing, datafication is a technological trend turning many aspects of our lives into computerized data using processes to transform organizations into data-driven enterprises by converting this information into new forms of value. Datafication refers to the fact that daily interactions of living things can be rendered into a data format and put to social use.

Examples:

And here could be many examples of datafication.

Let's say social platforms, Facebook or Instagram, for example, collect and monitor data information of our friendships to market products and services to us and surveillance services to agencies which in turn changes our behavior; promotions that we daily see on the socials are also the result of the monitored data. In this model, data is used to redefine how content is created by datafication being used to inform content rather than recommendation systems.



Datafication Uses

However, there are other industries where datafication process is actively used:

- **Insurance:** Data used to update risk profile development and business models.
- **Banking:** Data used to establish trustworthiness and likelihood of a person paying back a loan.
- **Human resources:** Data used to identify e.g. employees risk-taking profiles.
- **Hiring and recruitment:** Data used to replace personality tests.
- **Social science research:** Datafication replaces sampling techniques and restructures the manner in which social science research is performed.

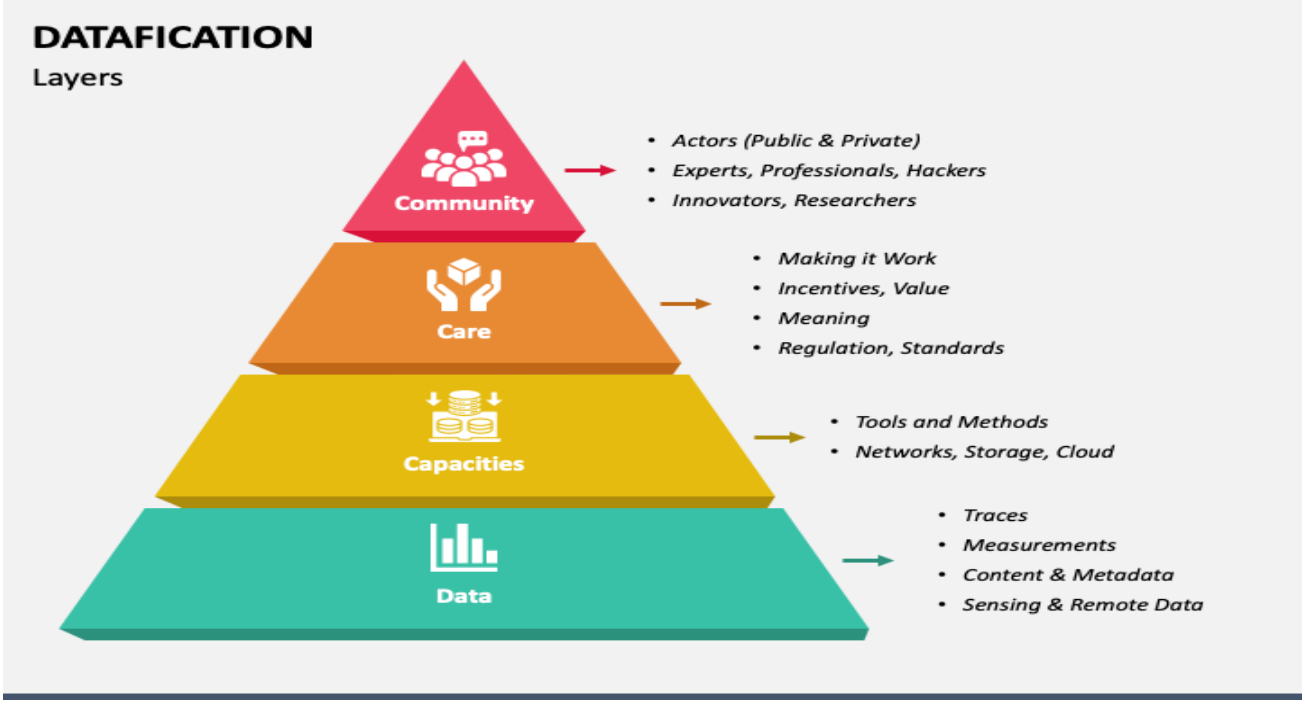
Netflix Case

Netflix, an internet streaming media provider, is a bright example of datafication process. It provides services in more than 40 countries and 33 million streaming members. Originally, operations were more physical in nature with its core business in mail order-based disc rental (DVD and Blu-ray). Simply said, the operating model was that the subscriber creates and maintains the queue (an ordered list) of media content that they want to rent (for example, a movie).

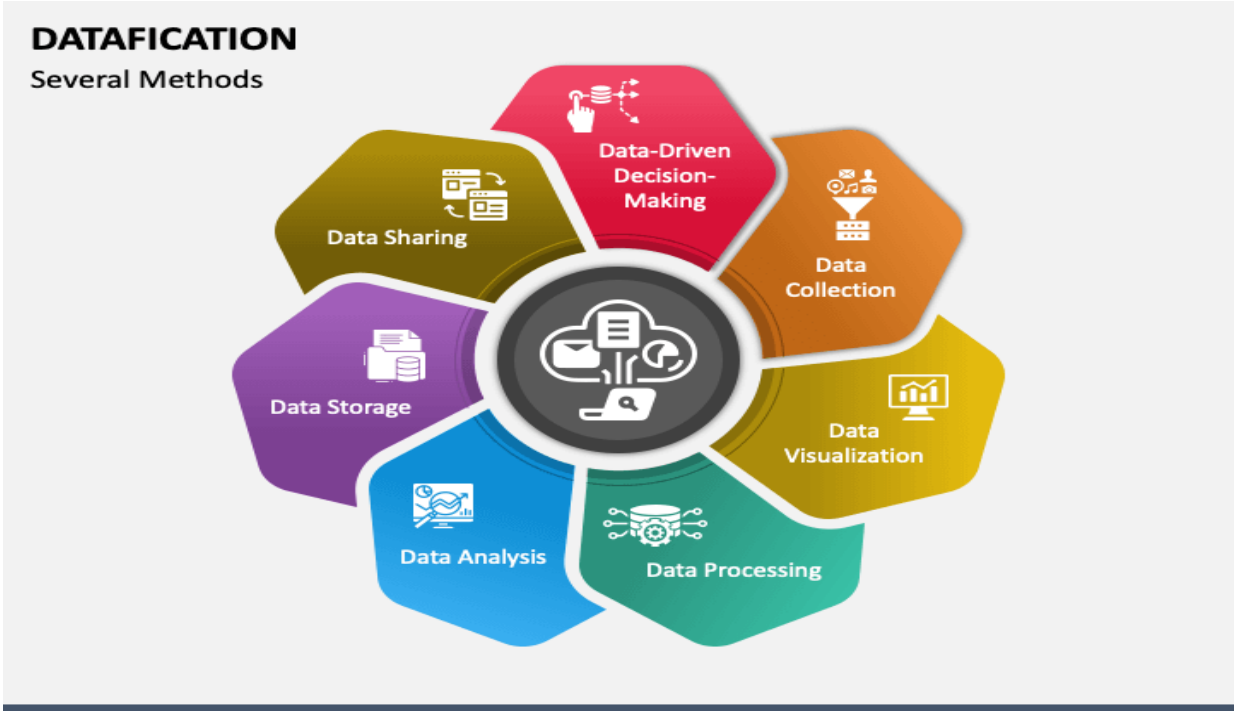
If you limit the total number of disks, the contents can be stored for a long time, as the subscriber wishes. However, to rent a new disk, the subscriber sends the previous one back to Netflix, which then forwards the next available disk to the subscriber's queue.

Thus, the business goal of the disk rental model is to help people fill their turn. The model has changed and now Netflix is actively transforming their service into a smart one, actively using datafication processes.

Datafication Layers



Methods of Datafication



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5. Semantic web

Introduction

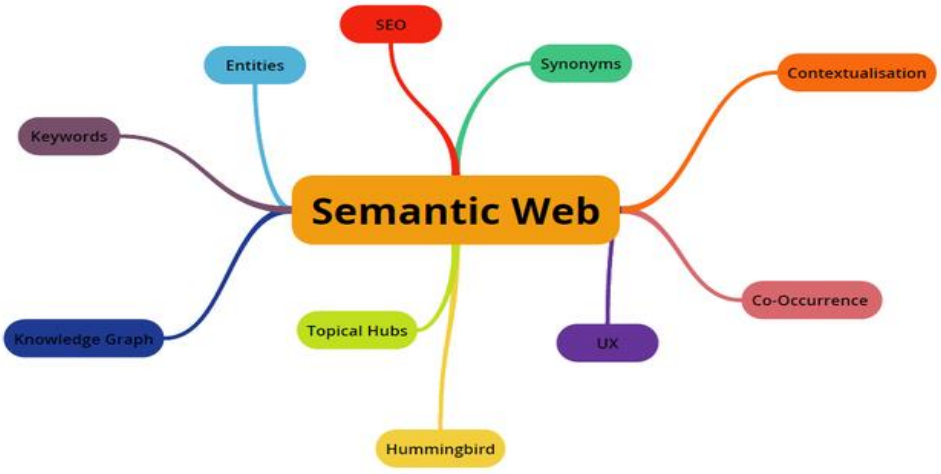
The World Wide Web, the invention of Tim Berners-Lee in 1989, has been a phenomenal success.In just under 30 years, more than 3.81 billion people worldwide have ued it, and the Web has grown more prominent over the years with a vast amount of information.
Fortunately, solutions exist to find relevant information in all this content.

Today, search engines, can recursively browse through the links of billions of web pages and index their content in massive databases. Thus a user performing a search will obtain a list of results classified in order of relevance corresponding to criteria specific to the search engine such as the frequency of keywords, density index, etc.

The Semantic Web is the solution

The Semantic Web is a concept designed to enable machines to understand the meaning of information on the Web. The aim is thus to set up, in addition to the network of hyperlinks between traditional web pages, a network of links between structured data.

Tim Berners-Lee, director of the W3C, coined the term.

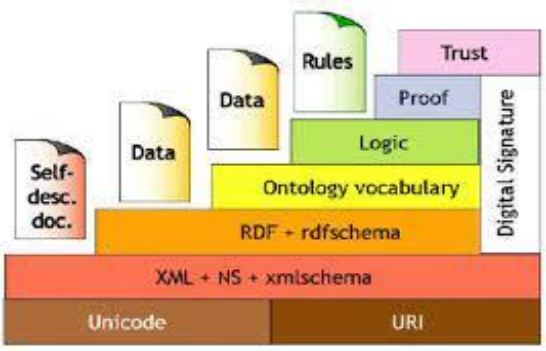


Resource Description Framework (RDF)

Created in 1999, RDF is a data exchange format on the Web and is the primary language of the Semantic Web. RDF adopts a graph model whose objective is to describe resources on the Internet (Companies, Books, Articles, etc….).

Three characteristics define an RDF data:

- **its subject:** the address of the targeted resource
- **its predicate:** the property assigned to the targeted resource
- **the object:** the value related to the property of the targeted resource



Ontologies

In computer science, an ontology represents a structured set of terms and concepts representing the meaning of an information field. The purpose of ontologies is to express the world around us in such a way that it is understandable by a machine and then to be able to make deductions from it.

There are particular languages to create these ontologies. Among them, we have for example OWL (Web Ontology Language) which is a knowledge representation language built on RDF.

FOAF (Friend Of A Friend) is a project whose aim is to create a network of web documents that can be understood by machines describing individuals and the relationships between them. Without the need for a centralized directory, FOAF allows people to be linked to each other as if everything was described in a single database.

Semantic Web applications

Different application areas use the Semantic Web technologies.

1.Social Networks

In social networks where the Semantic Web makes it possible to increase search possibilities and connect members.

2.Documentary classification

For bibliographic/documentary classification, the semantic web is also present in companies to collect and analyze large volumes of data.

3.Ecommerce Industry

Even in the E-commerce industry, to describe in a structure the products, prices, and information related to the company, it allows search engines to exploit this essential data better to restore them in their search context.

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6.Chatbots

Chatbots creation

Digitization is transforming society into a “mobile-first” population. As messaging applications grow in popularity, chatbots are increasingly playing an important role in this mobility-driven

transformation. Intelligent conversational chatbots are often interfaces for mobile applications and are changing the way businesses and customers interact.

Chatbots allow businesses to connect with customers in a personal way without the expense of human representatives. For example, many of the questions or issues customers have are common and easily answered. That's why companies create FAQs and troubleshooting guides.

Chatbots provide a personal alternative to a written FAQ or guide and can even triage questions, including handing off a customer issue to a live person if the issue becomes too complex for the chatbot to resolve. Chatbots have become popular as a time and money saver for businesses and an added convenience for customers.

Evolution of chatbots

The origin of the chatbot arguably lies with Alan Turing's 1950s vision of intelligent machines.

Artificial intelligence, the foundation for chatbots, has progressed since that time to include super intelligent supercomputers such as IBM Watson.

The original chatbot was the phone tree, which led phone-in customers on an often cumbersome and frustrating path of selecting one option after another to wind their way through an automated customer service model. Enhancements in technology and the growing sophistication of AI, ML, and NLP evolved this model into pop-up, live, onscreen chats. And the evolutionary journey has continued.

With today's digital assistants, businesses can scale AI to provide much more convenient and effective interactions between companies and customers—directly from customers' digital devices.

Definition

At the most basic level, a chatbot is a computer program that simulates and processes human conversation (either written or spoken), allowing humans to interact with digital devices as if they were communicating with a real person.

Chatbots can be as simple as rudimentary programs that answer a simple query with a single-line response, or as sophisticated as digital assistants that learn and evolve to deliver increasing levels of personalization as they gather and process information.

You've probably interacted with a chatbot whether you know it or not. For example, you're at your computer researching a product, and a window pops up on your screen asking if you need help. Or perhaps you're on your way to a concert and you use your smartphone to request a ride via chat. Or you might have used voice commands to order a coffee from your neighborhood café and received a response telling you when your order will be ready and what it will cost. These are all examples of scenarios in which you could be encountering a chatbot.

Benefits of Chatbots

AI Chatbots are a one-time investment that can offer instant self-service, deflect a significant number of inquiries, and can quickly scale as your requirements grow. Chatbots can increase customer satisfaction through frictionless support. It can offer precise answers to questions and point customers in the right direction. Moreover, smart chatbots can offer contextual advice and escalate conversations to a live agent when necessary.

So if you are evaluating the implementation of chatbots for your customer service, you should be aware of some major AI chatbot benefits that will help you make better business decisions.

1.Saves Respond Time

Common questions like "What's your refund policy?" shouldn't need a support agent to intervene. Chatbots can understand the intent of the questions and give a direct answer. It can also help customers with troubleshooting workflows to solve their queries themselves.

2.Available Anytime and Anywhere

The most important benefit of implementing a chatbot is that it can offer round-the-clock support. Also, chatbots are a low-friction solution as they are available on every screen and in messenger apps like Facebook Messenger, WhatsApp, and Apple Business Chat.

3.Improves Customer Engagement

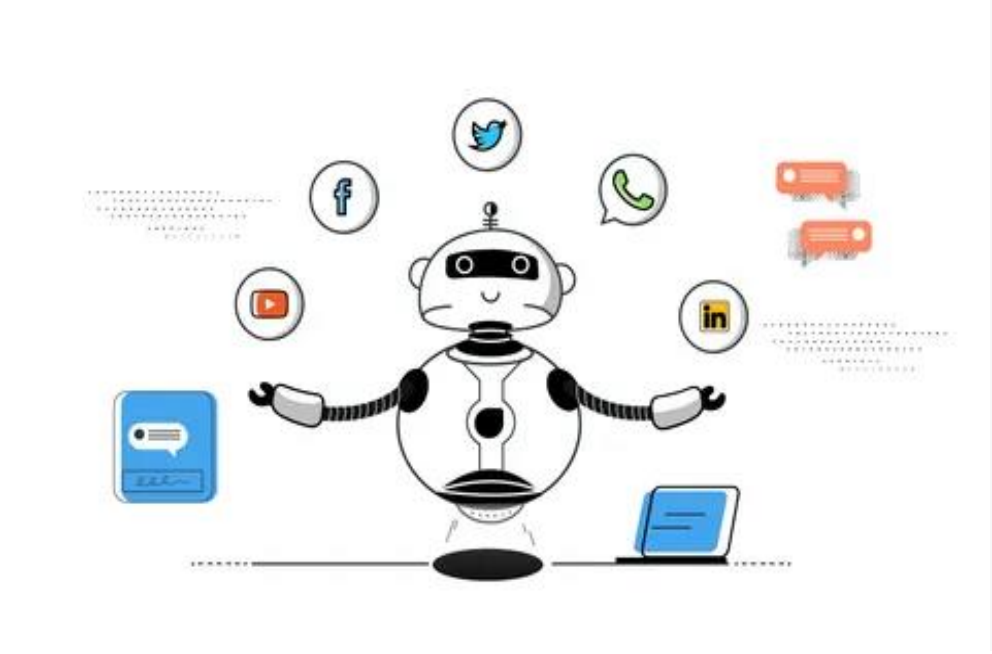
Your business should be able to engage with your customers at every step of their journey. Chatbots can help personalize conversations, nurture your leads better, and improve engagement across your funnel by urging customers to participate in discussions that can help them build a connection with your business.

4.Personalizes conversations Every time

Chatbots allow you to share updates and notifications to build brand loyalty quickly. At scale, it's difficult for your business to engage with clients at a personal level. However, chatbots can understand your customer's intent, order history and personalize outreach to improve engagement quality.

5.Nudge Towards Actions

Chatbots close the loop with your customers. They can trigger actions and flows like booking appointments, making payments, or collecting feedback. So the visitor won't have to leave without taking a step towards a purchase.



Types of Chatbots

Driven by AI, automated rules, natural-language processing (NLP), and machine learning (ML), chatbots process data to deliver responses to requests of all kinds.

There are two main types of chatbots.

1.Task-oriented (declarative) chatbots are single-purpose programs that focus on performing one function. Using rules, NLP, and very little ML, they generate automated but conversational responses to user inquiries. Interactions with these chatbots are highly specific and structured and are most applicable to support and service functions—think robust, interactive FAQs. Task-oriented chatbots can handle common questions, such as queries about hours of business or simple transactions that don't involve a variety of variables.

Though they do use NLP so end users can experience them in a conversational way, their capabilities are fairly basic. These are currently the most commonly used chatbots.

2.Data-driven and predictive (conversational) chatbots are often referred to as virtual assistants or digital assistants, and they are much more sophisticated, interactive, and personalized than task-oriented chatbots. These chatbots are contextually aware and leverage natural-language understanding (NLU), NLP, and ML to learn as they go. They apply predictive intelligence and analytics to enable personalization based on user profiles and past user behavior. Digital assistants can learn a user's preferences over time, provide recommendations, and even anticipate needs. In addition to monitoring data and intent, they can initiate conversations. Apple's Siri and Amazon's Alexa are examples of consumer-oriented, data-driven, predictive chatbots.

Advanced digital assistants are also able to connect several single-purpose chatbots under one umbrella, pull disparate information from each of them, and then combine this information to perform a task while still maintaining context—so the chatbot doesn't become "confused."

Common chat bot uses

Chatbots are frequently used to improve the IT service management experience, which delves towards self-service and automating processes offered to internal staff. With an intelligent chatbot, common tasks such as password updates, system status, outage alerts, and knowledge management can be readily automated and made available 24/7, while broadening access to commonly used voice and text based conversational interfaces.

On the business side, chatbots are most commonly used in customer contact centers to manage incoming communications and direct customers to the appropriate resource. They're also frequently used for internal purposes, such as onboarding new employees and helping all employees with routine activities including vacation scheduling, training, ordering computers and business supplies, and other self-service activities that don't require human intervention.

On the consumer side, chatbots are performing a variety of customer services, ranging from ordering event tickets to booking and checking into hotels to comparing products and services. Chatbots are also commonly used to perform routine customer activities within the banking, retail, and food and beverage sectors. In addition, many public sector functions are enabled by chatbots, such as submitting requests for city services, handling utility-related inquiries, and resolving billing issues.

The Future of chatbots

Where is the evolution of chatbots headed? Chatbots, like other AI tools, will be used to further enhance human capabilities and free humans to be more creative and innovative, spending more of their time on strategic rather than tactical activities.

In the near future, when AI is combined with the development of 5G technology, businesses, employees, and consumers are likely to enjoy enhanced chatbot features such as faster recommendations and predictions, and easy access to high-definition video conferencing from within a conversation. These and other possibilities are in the investigative stages and will evolve quickly as internet connectivity, AI, NLP, and ML advance. Eventually, every person can have a fully functional personal assistant right in their pocket, making our world a more efficient and connected place to live and work.

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7.Ephemeral Content

Introduction

Ephemeral content is social media content that is only available for short periods of time. For example, TikTok, Instagram Stories and Snapchat.

Much like limited sales in stores, they instill a sense of excitement in people, encouraging them to engage in the action while it is still going on.

The same goes for **ephemeral content;** people want to click on the content while it's still there in fear of missing out on some great content.

For example, not being able to chat with friends about the story Justin Bieber posted would be devastating for fans that like to talk amongst their friends, **and that's why it's so effective.**

The great thing about **ephemeral content** for businesses is that using it almost *forces* their followers to view the story, primarily if regularly used to provide promotional codes and limited discounts.

FOMO is very much like the term **YOLO** *(you only live once)* because it all comes back to the same concept of making sure you do it now.

Another bonus of **ephemeral content** is that because it is only temporary and disappears after 24 hours, those who use it don't have to worry about a particularly embarrassing piece of content being on the internet forever. **That is, of course, unless someone decided to save your story or screen record.**

Ephemeral Marketing

Short-lived stories are a path to increased engagement. Ephemeral content – which refers to posts/ messages that vanish within 24 hours – was first introduced by Snapchat in 2013. Since then, Snap has grown to 200 million users and ephemeral content has been exploding in popularity.

Today, we see the widespread use of Stories, which have become key features on both Facebook and Instagram. With all the hype, WhatsApp is now testing disappearing messages as well.

So, the question marketers should be asking is, "Why is this trend important and how should we respond?"

The power of story-telling and engagement

The reason that ephemeral content is important in social media marketing, is because it has had a profound effect on user engagement. It's roughly doubled the amount of time people spend on Instagram. It's natural to have a fear of missing out (also known as FOMO). This is partly due to the "FOMO" factor, with users checking in more frequently to avoid being left out.

Stories are also a great way to boost engagement via interactivity and user-generated content. This can be accomplished with branded filters, geo-filters, polls and live-stream videos allow brands to connect with an audience on a more candid level – perfect for startups and small business.

Stories carry the additional benefit of a brighter spotlight. Rather than being buried among your other posts, stories are pinned at the top of the page. Given this high visibility, you'll want to ensure you're creating stories that truly resonate.

The key here is authenticity. Perfectionism is losing its appeal so we would recommend focusing on telling your brand's story from a genuine perspective.

How much Ephemeral Content should we be sharing?

Quantity vs. quality is always on an ongoing balance in social media. You need to be present regularly but you also don't want to bore your consumers. Content can become more repetitive in ephemeral stories than on the IG grid as there is only so much product imagery one can share and still find interesting – especially when you can be hearing someone else talk directly which generally is more compelling.

We explain how important it is to be authentic in our Do's and Don'ts of Social Media posts and the same principles apply to ephemeral content. Refer to your digital strategy and use stories as an extension of your brand values rather than a strict format that is heavily constructed.

Ephemeral Content Benefits

1. Great Ephemeral Content Is Interactive

Compared to other types of advertisement, **ephemeral content** enables users to connect with brands on a more personal level.

The following are some of the most successful engagement-boosting ephemeral advertising strategies:

1. Using branded filters, geo-filters, and other methods to encourage **user-generated content**. Well-known influencers and celebrities will often use a filter that takes their fancy when creating their stories, and users following them will do that too.
2. You may ask viewers for their thoughts or invite them to submit questions by using surveys and Q&As. The user is more than encouraged to submit their answers or questions, especially if the request comes from an influencer or celebrity.

   Again, the FOMO idea comes into play, and users will happily submit questions and answers to their favourite celebrities in the hope of acknowledgment.

3. You can engage with your viewers in real-time by using live-streaming videos. Much like surveys and Q&As, the fear of missing out on the chance to see a favourite celebrity talking live draws people in. Instagram also notifies users when people they're following go live even if they aren't using the app, meaning more people are drawn towards the **ephemeral content.**
4. To get more exposure, you can tag other users and locations. Some influencers and celebrities choose to host an *"Instagram live"* together to generate even more views, not to mention the subsequent followers each account will receive during and after.

Ephemeral content is also great for recording the interaction of your users on your stories. You can view how many people have seen the story, as well as who interacted with it.

For example, asking whether people prefer gin or tequila on a story would allow you to see which users voted for gin and vice versa. You will also see **analytics on other things** such as polls, questions, and how many people visited your profile because of that content.

Another fantastic way of utilizing **ephemeral content** is by using a particular holiday or time of day to bring people in to watch your content. You can send reminders to your subscribers about your content once it goes live, just figure out the best time to send those emails.

Users can enjoy the luxury of watching their favorite creators on special holidays like Christmas, Halloween, and even New Year.

Instagram, Snapchat, and Facebook hold features that allow you to customize your content to fit the holiday, such as gifs, emoji's, timestamps, and even music.

2. Promote Users To Your Audience

Ephemeral content works well because it's real and raw, and people prefer to see that kind of content in this day and age. Snapchat was once the most popular social media platform because of this, and when Facebook and Instagram soon followed suit, Instagram experienced a large influx of users.

Users loved **ephemeral content** because it can enhance brand loyalty by demonstrating authenticity and exposing the real, genuine human faces and minds behind the products.

Ephemeral marketing campaigns allow the consumer to act on behalf of a brand, whether it be by editing and modifying photos or an opportunity to produce a brand-related image or story.

Ephemeral content can also be used to promote competitions and giveaways by requiring the user to interact somehow. It could be:

- **Voting on a poll**
- **Sharing the giveaway with their users**
- **Tagging the account on their stories**

It's a quick and easy way to vastly grow your exposure that doesn't cost followers any time at all.

3. Connect Content and Channels

Ensure you post content similar to other content on that particular site, no matter which social media platform you use.

Ephemeral content only works if it's developed for your desired platform. It must also be consistent with your own brand name, logo, and color scheme – basically be a part of your overall brand marketing strategy.

If you want your **ephemeral content** to be credible, it must match your overall brand name. It goes without saying that your content should be fresh, snappy, amusing, and easy to share.

A word of advice: visual content is 40 times more likely to be shared than written material. People won't watch your video unless it guarantees something special, given the market's ever-shrinking attention span of users.

You can use previous **ephemeral content** to re-engage users by creating a series of content for users to look forward to.

For example, if you're in the smart home technology industry, creating a *"live"* series for your followers to see how they can easily install your products is an excellent way of keeping people engaged.

If you've noticed regular viewers, reward them with something for their loyalty. This could be anything from a shootout to money off their next order with you. Doing this encourages others to continue watching and again instills that feeling of FOMO.

4. Create Genuine Insider Views

One of the best things about **ephemeral content** is that *because* it's so raw and honest, you can afford to make minor errors, and the odd *"ummm"* in a video can be easily forgiven. **Take advantage of this!**

If you've got something exciting happening behind the scenes, let your followers see and become a part of it all!

Whether it's a new product landing on your shelves or welcoming a new member of staff to the team, getting your followers involved will help build up brand loyalty and make them feel like they're a part of the team too.

Creating that *urgency*, that *longing to be there with you* by showing your followers around your home or office, adds to the FOMO that **ephemeral content** utilizes so brilliantly.

With **ephemeral content,** you've got the opportunity to show people what's going on in your world in real-time. Much like reality television shows, seeing what others are doing in real-time is *oh-so-satisfying*, and you should utilize that for your social media channels.

Another great thing about **ephemeral content** is that your call to action doesn't have to change.

For example, suppose you're selling merchandise, and you've just released a new hoody on your store. In that case, you can create **ephemeral content** showing images or videos of you and others sporting your new merchandise.

It again creates that sense of urgency to be part of the crowd and, ultimately, be the first to purchase the next big thing on the market.

5. Plan, Don't Script

One thing to remember with **ephemeral content** is that you don't necessarily need a script. A small amount of planning will help you create high-quality yet real content that your followers will love.

Try not to worry too much about your video being perfect!

First, you may feel like you need to film different takes for your stories, but you don't need to do this! Focus more on the actual content rather than where you are or what you look and sound like. Here are some tips to help you plan your content:

- Create an outline for your **ephemeral content** rather than a *"script."* Focusing too much on what you have to say will make you seem robotic and, therefore, boring.
- **Keep your videos reasonably short.** You have mere moments to capture your followers' attention, and long videos will likely make them exit your content. How short? Check out this handy guide on Instagram Video length to get started.
- **Don't be afraid to show personality!** For example, if someone comments during your Instagram live, feel free to reply to their message. It's okay to go a little off-topic as long as the central message remains.
- **Try and shoot your content in one take.** It shows the raw and natural side of things and therefore becomes more captivating for the audience.

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8.Digital Trust

Introduction

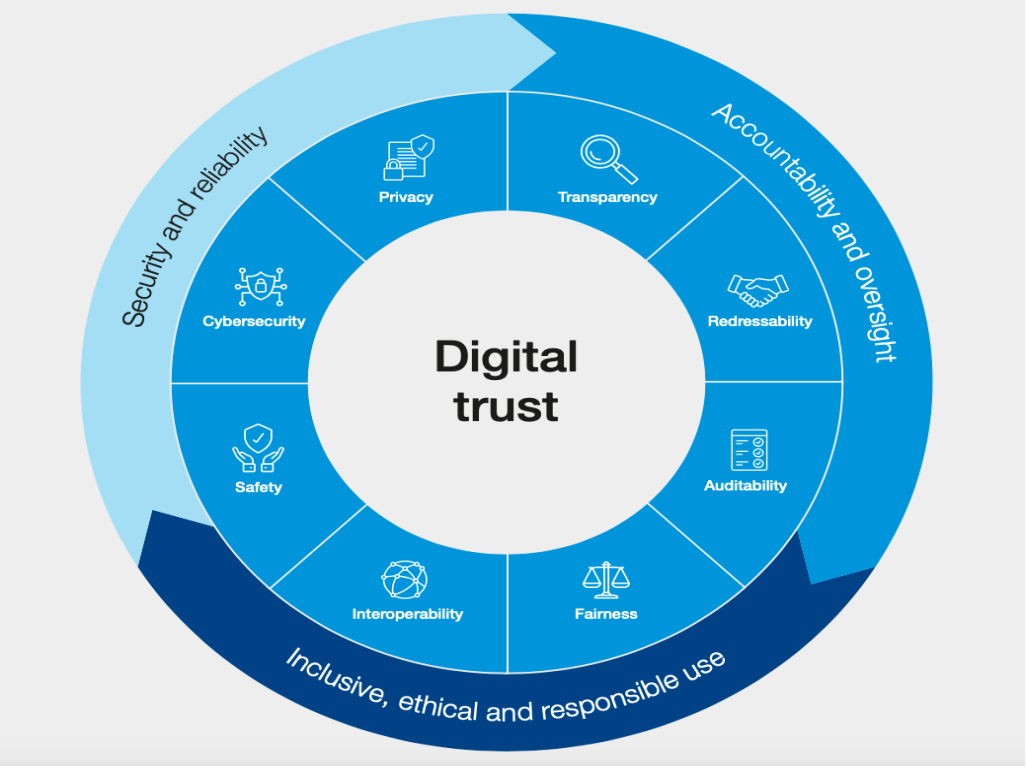
Digital trust is the confidence users have in the ability of people, technology and processes to create a secure digital world. Digital trust is given to companies who have shown their users they can provide safety, privacy, security, reliability, and data ethics with online programs or devices. When a person decides to use a company's product, they are confirming their digital trust in the business.

How does it work?

Digital trust divides dependable services from corrupt ones, helping the user decide on a secure company rather than an unreliable one. It creates a bond between a user and a company that assures the user they will be receiving what they are asking for in a safe, secure and reliable manner. The more digital trust a company receives, the more likely it will be to gain more users.

Digital trust is used by both digital service companies and their consumers. Users apply digital trust to the search process for a service or device. Consumers are more likely to use a company that is trustworthy than one that is unreliable. Companies aim to gain digital trust from consumers and use this goal to digitally transform themselves and create greater confidence in security, safety, privacy and reliability among consumers.

Digital trust is encouraging companies to focus on removing risk because it is something that negatively affects a consumer's confidence levels. Business leaders have started including cybersecurity and privacy personnel in their development process from the beginning, instead of ignoring them. This helps ensure the company is not avoiding security measures just to get their service or device on the market. Some businesses have also started adopting the zero trust model which decreases the number of opportunities a hacker has to access secure content by limiting who has privileged access to different machines or segments of the network.



The Four Paragons of Digital Trust

Security: Security is a fundamental component of digital trust. Customers need to know that their personal information is safe and secure when they interact with a business online. This means implementing strong security measures to protect against cyber threats, using encryption to safeguard sensitive data, and ensuring that all data is stored securely.

Transparency: Transparency is also essential to digital trust. Customers want to know how their

personal data is being collected, stored, and used. Businesses must be transparent about their data collection practices and provide clear and concise privacy policies that outline how customer data will be used.

Reliability: Reliability is another key component of digital trust. Customers want to know that they can rely on a business to deliver on its promises. This means providing accurate product information, delivering products and services on time, and providing excellent customer service.

User Experience: Customers expect a seamless and frictionless experience when they interact with a business online. This means providing a user-friendly website or mobile app, ensuring that pages load quickly, and making it easy for customers to complete transactions.

How Can Digital Trust Help Businesses Succeed?

Managing a business that needs to regularly gather and analyse information about customers is a challenging task. With every interaction and touchpoint, customers may wonder about the safety and security of their personal information. This is where digital trust becomes the foundation of a lasting and meaningful relationship between businesses and customers. How exactly?

Impact of Digital Trust on Customer Behaviour

When customers trust a business, they feel more comfortable sharing their personal information and making purchases online. This trust can be inspired by a business's strong data protection measures, which make customers more likely to engage with digital marketing and personalized services. Overall, digital trust plays a significant role in shaping consumer behaviour, including their willingness to share information and make online purchases.

The Impact of Digital Trust on Brand Reputation

A business's reputation is incredibly important, and digital trust can affect how people view a brand. If a business has a data breach or other security problem, it can harm the brand's reputation and make customers less likely to trust it. But if a business prioritizes digital trust and takes strong security measures, it can enhance its reputation and become known as a reliable and trustworthy provider.

The Relationship Between Digital Trust and Customer Loyalty

Customer loyalty is crucial for long-term business success, and digital trust is a key component of building and maintaining that loyalty. When customers trust a business to handle their personal data responsibly and prioritize their privacy, they are more likely to remain loyal to that business over time. By demonstrating a commitment to digital trust, businesses can establish themselves as reliable partners, strengthening the bond with customers and increasing repeat business.

Benefits of digital trust

The increased connection between businesses, government, industrial equipment and personal devices is generating increased cyber and privacy risks. Since most businesses are now working digitally in some way, their success is impacted by trust as much as it is by designing new products. As consumers share more and more personal information online with different businesses, they put more at risk and the importance of their confidence in the company increases.

Consumers are now placing more significance on the trust they have in a service and are looking for ways to ensure they are using the most reliable sources. This is forcing business leaders to re-evaluate and transform the ways in which they are running their company and the processes involved in creating services or devices with greater security and reliability; the need for trust is creating a digital transformation (DX). Companies are beginning to focus on managing privacy and cyber risks and including privacy and security personnel in project plans and budgets.

Digital trust will allow customers to find and choose the dependable digital services faster, better and with less unreliable choices to distract them. Eventually, machines will automate the decision process by calculating the level of confidence in a program. This will require more information to be provided about a company's service or product, creating increased transparency that will also build digital trust.

Digital trust in the IoT era

Internet of things (IoT) technologies have been displaying vulnerabilities across all industries. Consumers are losing confidence in the ability of manufacturers to produce secure, safe products. These devices are not being built with security in mind, thus opening them to the threat of hackers and data breaches. The companies are losing digital trust. Without trust, IoT will not be able to produce its intended results. In order to build confidence, IoT device manufacturers must first focus on improving the security in the device authentication process. Trust cannot be given unless the device has a solid authentication method which protects users from malware. Then, IoT must protect personal, sensitive data shared on the device through encryption.

How to Build Digital Trust

Below are five digital trust strategies to create transparency, privacy, and security:

Implement AI-based monitoring of data

Use AI algorithms to validate data accuracy, authenticity, and reliability in real-time, while detecting missing or unexpected data. This will ensure that data is used as intended and help safeguard trust.

Leverage data trusts

Use data trusts to manage data for others, operating as a trusted third party that validates, controls, and

secures data while managing legal data rights on behalf of its beneficiaries. This will enhance digital trust while making data management and sharing more trusted and easier.

Explore the potential of block chain

Use block chain as an enabler of digital trust, applying it for digital fingerprinting, identity, assets, and smart contracts. To overcome technological constraints and ensure trust, use quantum-resistant encryption techniques and maintain crypto-agility.

Build customer trust

Communicate transparently with customers about how their data is being managed, who is managing it, and how it is being used. Engage customers in the process and be careful in selecting third-party operators for data trusts.

Invest in talent and infrastructure

Invest in talent to develop and implement digital-first strategies, such as AI-based monitoring and block chain-enabled trust mechanisms. Additionally, invest in infrastructure to ensure that your organization has the necessary technology and systems to maintain digital trust.

Conclusion

Digital trust is a crucial aspect of modern businesses to establish a strong foundation of trust and ensure that customers feel confident in interacting and transacting with a business via technology. The four pillars of digital trust are security, transparency, reliability, and user experience, and businesses must prioritize them to enhance their digital reputation and build long-term customer loyalty. Digital trust also has a significant impact on customer behaviour, brand reputation, and customer loyalty. Therefore, businesses must invest in robust security measures and transparent data collection and usage policies to ensure that customer data is protected and privacy is maintained. Finally, businesses should leverage technologies like AI and data trust to monitor data accuracy and improve data security and control while managing legal data rights.

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9.A Version Control System Git and GitHub

Introduction

A version control system, or VCS, tracks the history of changes as people and teams collaborate on projects together. As developers make changes to the project, any earlier version of the project can be recovered at any time.

Developers can review project history to find out:

- Which changes were made?
- Who made the changes?
- When were the changes made?
- Why were changes needed?

VCSs give each contributor a unified and consistent view of a project, surfacing work that's already in progress. Seeing a transparent history of changes, who made them, and how they contribute to the development of a project helps team members stay aligned while working independently.

In a distributed version control system, every developer has a full copy of the project and project history. Unlike once popular centralized version control systems, DVCSs don't need a constant connection to a central repository. Git is the most popular distributed version control system. Git is commonly used for both open source and commercial software development, with significant benefits for individuals, teams and businesses.

- Git lets developers see the entire timeline of their changes, decisions, and progression of any project in one place. From the moment they access the history of a project, the developer has all the context they need to understand it and start contributing.
- Developers work in every time zone. With a DVCS like Git, collaboration can happen any time while maintaining source code integrity. Using branches, developers can safely propose changes to production code.
- Businesses using Git can break down communication barriers between teams and keep them focused on doing their best work. Plus, Git makes it possible to align experts across a business to collaborate on major projects.

What is Git?

Git is a popular version control system. It was created by Linus Torvalds in 2005, and has been maintained by Junior Hamano since then. It is used for:

- Tracking code changes
- Tracking who made changes
- Coding collaboration

What does Git do?

- Manage projects with **Repositories**
- **Clone** a project to work on a local copy
- Control and track changes with **Staging** and **Committing**
- **Branch** and **Merge** to allow for work on different parts and versions of a project
- **Pull** the latest version of the project to a local copy
- **Push** local updates to the main project

What is GitHub?

- Git is not the same as GitHub.
- GitHub makes tools that use Git.
- GitHub is the largest host of source code in the world, and has been owned by Microsoft since 2018.

About repositories

A repository, or Git project, encompasses the entire collection of files and folders associated with a project, along with each file's revision history. The file history appears as snapshots in time called commits. The commits can be organized into multiple lines of development called branches. Because Git is a DVCS, repositories are self-contained units and anyone who has a copy of the repository can access the entire codebase and its history.

Using the command line or other ease-of-use interfaces, a Git repository also allows for: interaction with the history, cloning the repository, creating branches, committing, merging, comparing changes across versions of code, and more.

Through platforms like GitHub, Git also provides more opportunities for project transparency and collaboration. Public repositories help teams work together to build the best possible final product.

How GitHub works

GitHub hosts Git repositories and provides developers with tools to ship better code through command line features, issues (threaded discussions), pull requests, code review, or the use of a collection of free and for-purchase apps in the GitHub Marketplace. With collaboration layers like the GitHub flow, a community of 100 million developers, and an ecosystem with hundreds of integrations, GitHub changes the way software is built.

GitHub builds collaboration directly into the development process. Work is organized into repositories where developers can outline requirements or direction and set expectations for team members. Then, using the GitHub flow, developers simply create a branch to work on updates, commit changes to save them, open a pull request to propose and discuss changes, and merge pull requests once everyone is on the same page.

GitHub and the command line

Basic Git commands

To use Git, developers use specific commands to copy, create, change, and combine code. These commands can be executed directly from the command line or by using an application like GitHub Desktop. Here are some common commands for using Git:

- **git init** initializes a brand new Git repository and begins tracking an existing directory. It adds a hidden subfolder within the existing directory that houses the internal data structure required for version control.
- **git clone** creates a local copy of a project that already exists remotely. The clone includes all the project's files, history, and branches.
- **git add** stages a change. Git tracks changes to a developer's codebase, but it's necessary to stage and take a snapshot of the changes to include them in the project's history. This command performs staging, the first part of that two-step process. Any changes that are staged will become a part of the next snapshot and a part of the project's history. Staging and committing separately gives developers complete control over the history of their project without changing how they code and work.
- **git commit** saves the snapshot to the project history and completes the change-tracking process. In short, a commit functions like taking a photo. Anything that's been staged with git add will become a part of the snapshot with git commit.
- **git status** shows the status of changes as untracked, modified, or staged.
- **git branch** shows the branches being worked on locally.
- **git merge** merges lines of development together. This command is typically used to combine changes made on two distinct branches. For example, a developer would merge when they want to combine changes from a feature branch into the main branch for deployment.
- **git pull** updates the local line of development with updates from its remote counterpart. Developers use this command if a teammate has made commits to a branch on a remote, and they would like to reflect those changes in their local environment.
- **git push** updates the remote repository with any commits made locally to a branch.

Example: Contribute to an existing repository

```
# download a repository on GitHub to our machine

# Replace `owner/repo` with the owner and name of the repository to clone

git clone https://github.com/owner/repo.git

# change into the `repo` directory

cd repo

# create a new branch to store any new changes

git branch my-branch

# switch to that branch (line of development)

git checkout my-branch

# make changes, for example, edit `file1.md` and `file2.md` using the text editor

# stage the changed files

git add file1.md file2.md

# take a snapshot of the staging area (anything that's been added)

git commit -m "my snapshot"

# push changes to github

git push --set-upstream origin my-branch
```

Example: Start a new repository and publish it to GitHub

First, you will need to create a new repository on GitHub. For more information, see "Hello World." Do not initialize the repository with a README, gitignore or License file. This empty repository will await your code.

```
# create a new directory, and initialize it with git-specific functions

git init my-repo

# change into the `my-repo` directory

cd my-repo

# create the first file in the project

touch README.md
```

```
# git isn't aware of the file, stage it

git add README.md

# take a snapshot of the staging area

git commit -m "add README to initial commit"

# provide the path for the repository you created on github

git remote add origin https://github.com/YOUR-USERNAME/YOUR-REPOSITORY-NAME.git

# push changes to github

git push --set-upstream origin main
```

Example: contribute to an existing branch on GitHub

This example assumes that you already have a project called repo on the machine and that a new branch has been pushed to GitHub since the last time changes were made locally.

```
# change into the `repo` directory

cd repo

# update all remote tracking branches, and the currently checked out branch

git pull

# change into the existing branch called `feature-a`

git checkout feature-a

# make changes, for example, edit `file1.md` using the text editor

# stage the changed file

git add file1.md

# take a snapshot of the staging area

git commit -m "edit file1"

# push changes to github

git push
```

Models for collaborative development

There are two primary ways people collaborate on GitHub:

1. Shared repository
2. Fork and pull

With a shared repository, individuals and teams are explicitly designated as contributors with read, write, or administrator access. This simple permission structure, combined with features like protected branches, helps teams progress quickly when they adopt GitHub.

For an open source project, or for projects to which anyone can contribute, managing individual permissions can be challenging, but a fork and pull model allows anyone who can view the project to contribute. A fork is a copy of a project under a developer's personal account. Every developer has full control of their fork and is free to implement a fix or a new feature. Work completed in forks is either kept separate, or is surfaced back to the original project via a pull request. There, maintainers can review the suggested changes before they're merged.

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10.DEVOPS (DEVELOPMENT & OPERATIONS)

Introduction to DevOps?

DevOps is a set of practices, tools, and a cultural philosophy that automate and integrate the processes between software development and IT teams. It emphasizes team empowerment, cross-team communication and collaboration, and technology automation.

The DevOps movement began around 2007 when the software development and IT operations communities raised concerns about the traditional software development model, where developers who wrote code worked apart from operations who deployed and supported the code. The term DevOps, a combination of the words development and operations, reflects the process of integrating these disciplines into one, continuous process.

How does DevOps work?

A DevOps team includes developers and IT operations working collaboratively throughout the product lifecycle, in order to increase the speed and quality of software deployment. It's a new way of working, a cultural shift, that has significant implications for teams and the organizations they work for.

Under a DevOps model, development and operations teams are no longer "siloed." Sometimes, these two teams merge into a single team where the engineers work across the entire application lifecycle from development and test to deployment and operations — and have a range of multidisciplinary skills.

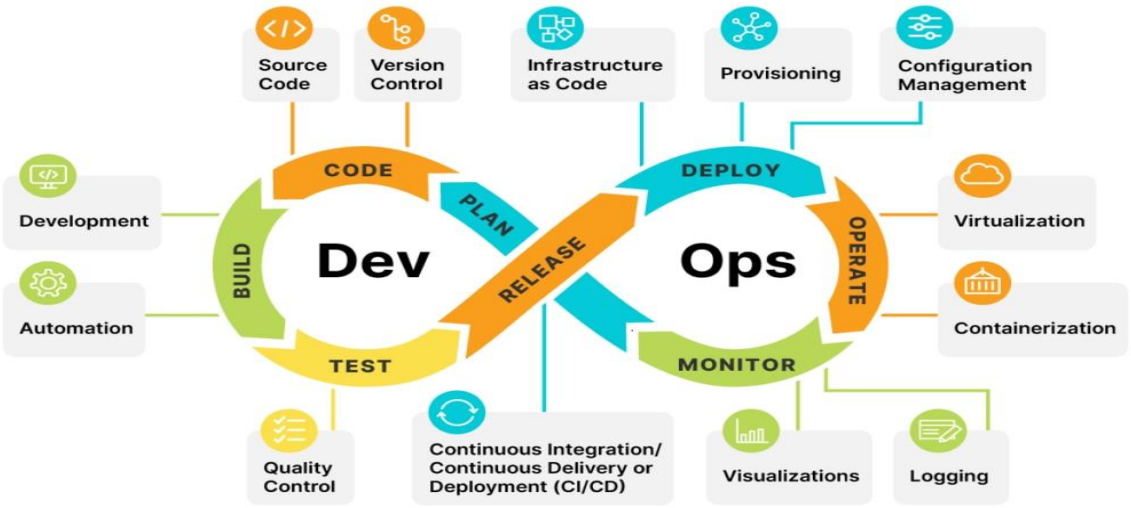
DevOps teams use tools to automate and accelerate processes, which helps to increase reliability. A DevOps toolchain helps teams tackle important DevOps fundamentals including continuous integration, continuous delivery, automation, and collaboration.

DevOps values are sometimes applied to teams other than development. When security teams adopt a DevOps approach, security is an active and integrated part of the development process. This is called DevSecOps.

The DevOps lifecycle

Because of the continuous nature of DevOps, practitioners use the infinity loop to show how the phases of the DevOps lifecycle relate to each other. Despite appearing to flow sequentially, the loop symbolizes the need for constant collaboration and iterative improvement throughout the entire lifecycle.

The DevOps lifecycle consists of eight phases representing the processes, capabilities, and tools needed for development (on the left side of the loop) and operations (on the right side of the loop). Throughout each phase, teams collaborate and communicate to maintain alignment, velocity, and quality.



Discover

Building software is a team sport. In preparation for the upcoming sprint, teams must workshop to explore, organize, and prioritize ideas. Ideas must align to strategic goals and deliver customer impact. Agile can help guide DevOps teams.

Plan

DevOps teams should adopt agile practices to improve speed and quality. Agile is an iterative approach to project management and software development that helps teams break work into smaller pieces to deliver incremental value.

Build

Git is a free and open source version control system. It offers excellent support for branching, merging, and rewriting repository history, which has led to many innovative and powerful workflows and tools for the development build process.

Test

Continuous integration (CI) allows multiple developers to contribute to a single shared repository.

When code changes are merged, automated tests are run to ensure correctness before integration. Merging and testing code often help development teams gain reassurance in the quality and predictability of code once deployed.

Deploy

Continuous deployment (CD) allows teams to release features frequently into production in an automated fashion. Teams also have the option to deploy with feature flags, delivering new code to users steadily and methodically rather than all at once. This approach improves velocity, productivity, and sustainability of software development teams.

Operate

Manage the end-to-end delivery of IT services to customers. This includes the practices involved in design, implementation, configuration, deployment, and maintenance of all IT infrastructure that supports an organization's services.

Observe

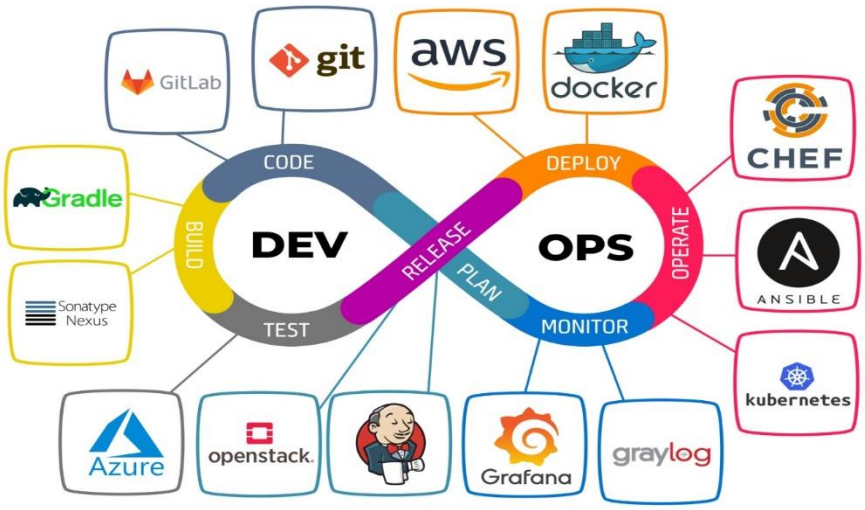
Quickly identify and resolve issues that impact product uptime, speed, and functionality. Automatically notify your team of changes, high-risk actions, or failures, so you can keep services on

Continuous feedback

DevOps teams should evaluate each release and generate reports to improve future releases. By gathering continuous feedback, teams can improve their processes and incorporate customer feedback to improve the next release.

DevOps Tools:

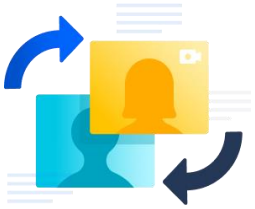
DevOps tool chains usually follow two approaches: an all-in-one or open toolchain. An all-in-one toolchain offers a complete solution that usually doesn't integrate with other third-party tools, while an open toolchain allows for customization with different tools. There are pros and cons to both approaches.



The benefits of DevOps include faster and easier releases, team efficiency, increased security, higher quality products, and consequently happier teams and customers.

Speed

Teams that practice DevOps release deliverables more frequently, with higher quality and stability. In fact, the DORA 2019 State of DevOps report found that elite teams deploy 208 times more frequently and 106 times faster than low-performing teams. Continuous delivery allows teams to build, test, and deliver software with automated tools.

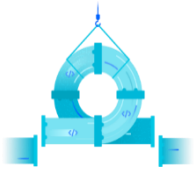


Improved collaboration

The foundation of DevOps is a culture of collaboration between developers and operations teams, who share responsibilities and combine work. This makes teams more efficient and saves time related to work handoffs and creating code that is designed for the environment where it runs.

Rapid deployment

By increasing the frequency and velocity of releases, DevOps teams improve products rapidly. A competitive advantage can be gained by quickly releasing new features and repairing bugs.



Quality and reliability

Practices like continuous integration and continuous delivery ensure changes are functional and safe, which improves the quality of a software product. Monitoring helps teams keep informed of performance in real-time.

Security

By integrating security into a continuous integration, continuous delivery, and continuous deployment pipeline, DevSecOps is an active, integrated part of the development process. Security is built into the product by integrating active security audits and security testing into agile development and DevOps workflows.

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11.Screenless Display

Introduction

Nowadays, advanced technologies are growing faster wherein each technology is renewed with implementation of new one. The current trending display technology most commonly used in gadgets such as tablets, smart phones, etc., is the touch-screen display, which will become outdated in the near future. Screen less display is the advanced display technology, which replaces the touch screen technology to resolve the problems and to make lives more comfortable. Therefore, this article is intended to give an idea of the screen less display, which transmits or displays the information without using a projector or the screen.

By using this screen less display technology, we can display the images directly on the open space, human retina and also to the human brain

Screen less Display Means

Screen less display is an interactive projection technology developed to solve the problems related to the device miniaturization of the modern communication technologies. The lack of space on screen based displays provides an opportunity for the development of screen less displays. As the name indicates screen less display has no screen and it can be defined as a display used to transmit any data such as pictures or videos without the help of screens.

Types of Screen less Display

Screen less display technology is divided into three main categories:

- Visual Image Display
- Retinal Display
- Synaptic Interface

The first category, visual image is defined as the things that can be seen by the human eye such as holograms. The second category, retinal display – the name itself- indicates the display of image directly onto the retina. The third category, synaptic reference which means sending information directly to the human brain. Let us look on in detail about these three display types.

1. Visual Image Display

The visual image is a type of screen less display, which recognizes any type of image or thing with the help of the human eye. The following are few examples of the visual image display: holographic display, virtual reality goggles, heads up display, etc. The working principle of this display states that the light gets reflected by the intermediate object before reaching the retina or the eye. The intermediate object can be a hologram, Liquid Crystal Displays (LCD)s or even windows.

By using the components like Helium Neon Laser, an object, a Lens, a holographic film and mirror, the **Holographic Displays** display the three dimensional (3D) images. A 3D image will be projected and appears to be floating in the air whenever the laser and object beams overlaps with each other. This display can supply accurate depth cues and high-quality images and videos that can be viewed by the human eyes without any need of special observation devices. Based on the colors of the laser projector, images are formed in three distinct planes. Holographic displays are commonly used as an alternative to screens.

A. Holographic Display

By using the components like Helium Neon Laser, an object, a Lens, a holographic film and mirror, the **Holographic Displays** display the three dimensional (3D) images. A 3D image will be projected and appears to be floating in the air whenever the laser and object beams overlaps with each other. This display can supply accurate depth cues and high-quality images and videos that can be viewed by the human eyes without any need of special observation devices. Based on the colors of the laser projector, images are formed in three distinct planes. Holographic displays are commonly used as an alternate.

Beheads Up Display

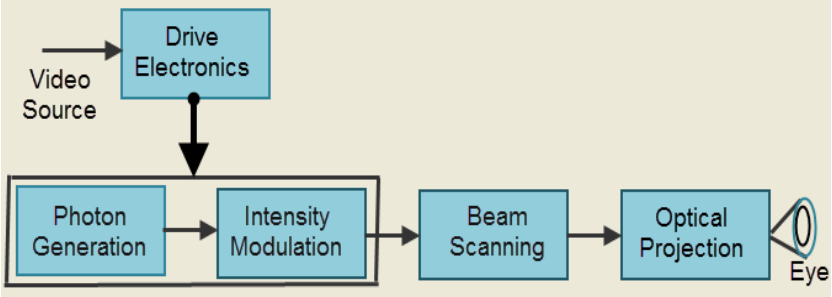
Heads up display are also named as transparent displays. These displays are applied in different applications such as aero planes, computer games and automobiles, etc. Many of the users do not need to look away from their field of view because the device displays the information on a windshield. An ordinary head up display comprises of following components: a projector unit, combiner and a computer. The projector unit projects the image, and the combiner redirects the displayed image by that projected image, and the field of view are seen simultaneously. The screen less computer acts as an interface between the projector and the combiner (data to be displayed).

The main advantage of visual image displays is creating and manipulating the images up to any size. In this category of displays, multiple bitmaps can be composited together in the object mode and, in the image mode, manipulation takes place. In this display system, Eye files are created which consists of all the images that are loaded. The EYE file creates a 'Export Project Command' in the file. These commands in EYE file provide a provision to save any sort of unsaved images in the form of bitmaps into it.

2.Retinal Display

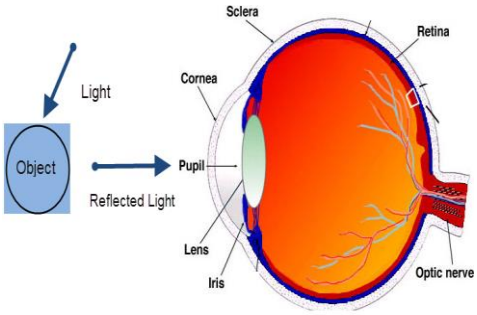
The second category of advancement in display system, retinal display as the name itself indicates the display of image directly onto the retina. Instead of using some intermediate object for light reflection

to project the images, this display directly projects the image onto the retina. The user will sense that the display is moving freely in the space. Retinal display is commonly known as retinal scan display and retinal projector. This display allows short light emission, coherent light and narrow band colour. Let us know about this display with the help of the following block diagram.

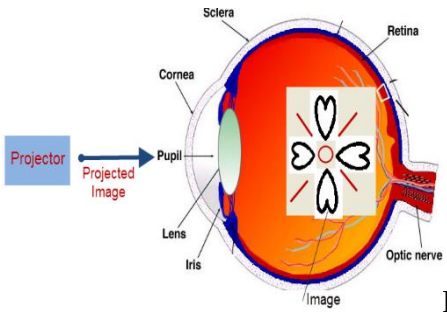


The block diagram of the virtual retinal display consists of following blocks: photon generation, intensity modulation, beam scanning, optical projection and drive electronics. Photon generation block generates the coherent beam of light; this photon source makes use of the laser diodes as coherent source with retina display to give a diffraction onto the retina of the human eye. The light generated from photon source is intensity modulated. The intensity of the light beam gets modulated to match the intensity of the image.

The below figure shows how vision works



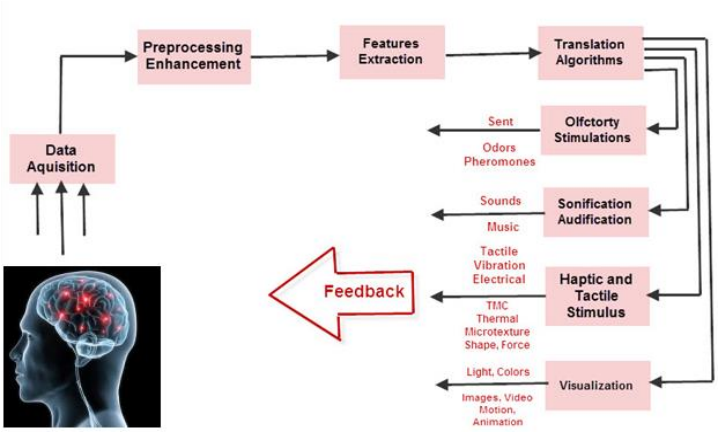
The modulated beam gets scanned by the beam scanning. By using this scanning block, the image is placed onto the retina. In this beam scanner, two types of scanning modes take place: raster mode and vector mode. After the scanning process, optical projection takes place for projecting a spot-like beam onto the retina of the eye. The spot focused on the eye is sketched as an image. A drive electronics placed on the photon generator and intensity modulator is used for synchronization of the scanner, modulator and coming video signal. These displays are made available in the market by using MEMS technology.



Retinal Projection

3. Synaptic Interface:

The third category, synaptic interface means sending information directly to the human brain without using any light. This technology is already tested on humans and most of the companies started using this technology for effective communication, education, business and security system. This technology was successfully developed by sampling the video signals from horse crab eyes through their nerves, and the other video signals are sampled from the electronic cameras into the brains of creatures.



Synaptic Interface

The brain computer interface allows direct interaction between the human brain and external devices such as computer. This category can also be known by different names such as human machine interface, synthetic telepathy interface, mind machine interface and direct neural interface.

These are the three types of latest Screen less displays which replace the current use of touch screen technology to fill the lack of space in the screen-based electronic displays. We hope that the future definitely looks promising for this technology. Let us wait for the day when we all will be treated by this technology.

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12.Cryptocurrency

Introduction

Cryptocurrency is decentralized digital money that is based on block chain technology and secured by cryptography. To understand cryptocurrency, one needs to first understand three terminologies – block chain, decentralization, and cryptography.

Working of Cryptocurrency

In simple words, block chain in the context of cryptocurrency is a digital ledger whose access is distributed among authorized users. This ledger records transactions related to a range of assets, like money, house, or even intellectual property.

The access is shared between its users and any information shared is transparent, immediate, and "immutable". Immutable means anything that block chain records is there for good and cannot be modified or tampered with even by an administrator.

Cryptocurrencies are not controlled by the government or central regulatory authorities. As a concept, cryptocurrency works outside of the banking system using different brands or types of coins – Bitcoin being the major player.

1. Mining

Cryptocurrencies (which are completely digital) are generated through a process called "mining". This is a complex process. Basically, miners are required to solve certain mathematical puzzles over specially equipped computer systems to be rewarded with bitcoins in exchange.

In an ideal world, it would take a person just 10 minutes to mine one bitcoin, but in reality, the process takes an estimated 30 days.

2.Buying, selling, and storing

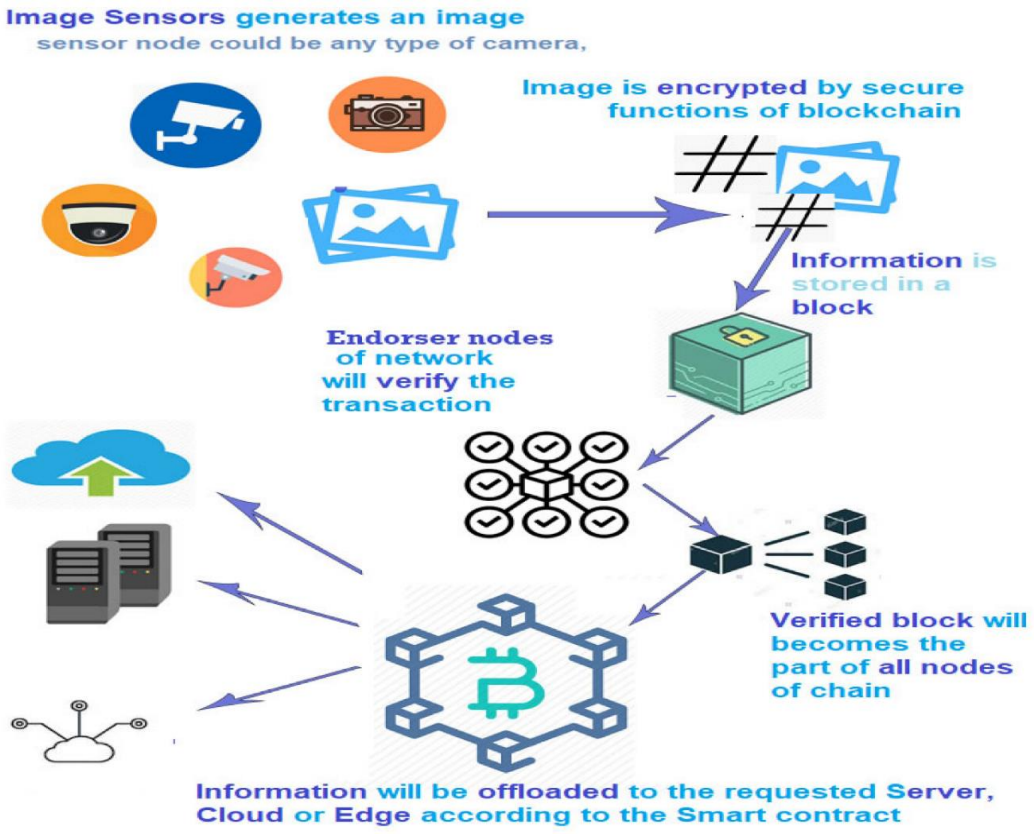
Users today can buy cryptocurrencies from central exchanges, brokers, and individual currency owners or sell it to them. Exchanges or platforms like Coin base are the easiest ways to buy or sell cryptocurrencies.

Once bought, cryptocurrencies can be stored in digital wallets. Digital wallets can be "hot" or "cold". Hot means the wallet is connected to the internet, which makes it easy to transact, but vulnerable to thefts and frauds. Cold storage, on the other hand, is safer but makes it harder to transact.

3.Transacting or investing

Cryptocurrencies like Bitcoins can be easily transferred from one digital wallet to another, using only a

smartphone. Once you own them, your choices are to:



a) use them to buy goods or services

b) trade in them

c) exchange them for cash

If you are using Bitcoin for purchases, the easiest way to do that is through debit-card-type transactions. You can also use these debit cards to withdraw cash, just like at an ATM. Converting cryptocurrency to cash is also possible using banking accounts or peer-to-peer transactions.

Benefits of Cryptocurrency

Centralized money refers to the regular money that we use, which is governed by authorities like the Reserve Bank of India. Decentralization in cryptocurrency means there is no similar authority that can be held responsible for supervising the rise and fall of a particular cryptocurrency. This has many benefits over centralized money.

- There is no need for currency owners to "trust" a single governing entity, as everyone in the network has access to the same information that cannot be altered.
- Data remains accessible only to the users of the network and it is heavily secured. Shared ownership also means all users sign off on how accurate the data is, which means there is very little scope for data mismanagement or miscommunication. Think of it as a democracy.
- Security, which is a fundamental part of a block chain.

Cryptography is the method that secures data from unauthorized access by the use of encryption techniques. Most of the claims that block chain makes, like privacy and immutability, are enabled through cryptography.

The roots of cryptocurrency technology can be traced back to the 1980s with the invention of what is called a "blinding algorithm". The algorithm is all about secure and immutable digital transactions. It remains fundamental to the modern-day digital currency.

The underlying block chain technology is today used in banking, insurance, and other business sectors. Growing at a compounded annual growth rate of 12.8% since 2021, the cryptocurrency market is estimated to reach $4.94 billion by 2030, thanks to the need to improve the efficiency of today's payment systems, rise in global remittances and increased need to secure data.

Types of Cryptocurrencies

There are tens of thousands of cryptocurrencies available today with the figure pegged at 10,000 in 2022. Major cryptocurrencies include the following:

Bitcoin

Bitcoin is the world's first widely accepted form of cryptocurrency. Bitcoin is so popular, there was a time when its name was synonymous with cryptocurrency. But potential investors need to know bitcoins have become very expensive. In 2021, the cost of one Bitcoin was $68,000. But the good news is, you don't always have to buy an entire coin, you can buy smaller fractions of it.

Altcoin

Altcoin is the term used for any alternative digital currency to bitcoin. The most popular in this ecosystem is

Ethereum – one of the fastest-growing cryptocurrencies in the market. There is also a range of other altcoins in the market today such as Luckyblock, Shiba Inu and Terra.

Crypto Tokens

The concept of crypto coins' vs tokens can be confusing to many. At first glance, coins and tokens appear the same. However, the two have many differences

- Coins can be mined, but tokens cannot be mined.
- Coins are linked to block chains, tokens are not.
- In terms of utility, they vary in the type of product or service they allow users to purchase.

There are many advantages to dealing in cryptocurrencies, and a fair share of disadvantages as well. Here are the top three reasons that work in favor of and against cryptocurrencies.

Advantages:

- **They are private and secure:** The block chain technology that fuels cryptocurrencies ensure user anonymity. It also assures high levels of security through cryptography, which we discussed before.

- **They are decentralized, immutable, and transparent:** The entire system functions on shared ownership, where data is available to all permissioned members and is tamper-proof.

- **They are a hedge against inflation:** Cryptocurrency makes for a great investment in times of inflation. For example, investors often compare cryptocurrency to gold. One of the reasons behind this is that, just like gold, they are in limited supply, as there is a cap on mining any type of cryptocurrency.

Disadvantages:

- **They are not widely understood:** They are a relatively new concept and the long-term sustainability of cryptocurrencies remains to be seen.

- **They are prone to high risks:** Needless to say, cryptocurrencies bring in as many rewards as risks. Their highly volatile and speculative nature makes them prone to sharp downward spirals. Investing in cryptocurrency can be risky for many reasons.

- A major deterrent could be the fact that digital currency seems to have no inherent or underlying value. There is a supply-demand type of equation that is used to determine the value of cryptos like bitcoins.
- Plus, it is easy to see how simple speculations over the internet can result in a substantial rise or loss of value of these coins. Also the fact that cryptocurrencies are banned or their usage restricted in a lot of countries plays out as a significant risk. Their legality is debatable in countries like India.

- **Scalability is a problem:** This is a complex issue, which has more to do with the technology side of the block chain. Simply put, the sluggish nature of the block chain makes it prone to transactional delays. This has the tendency to make crypto payments inefficient when compared to modern-day electronic payment techniques.

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