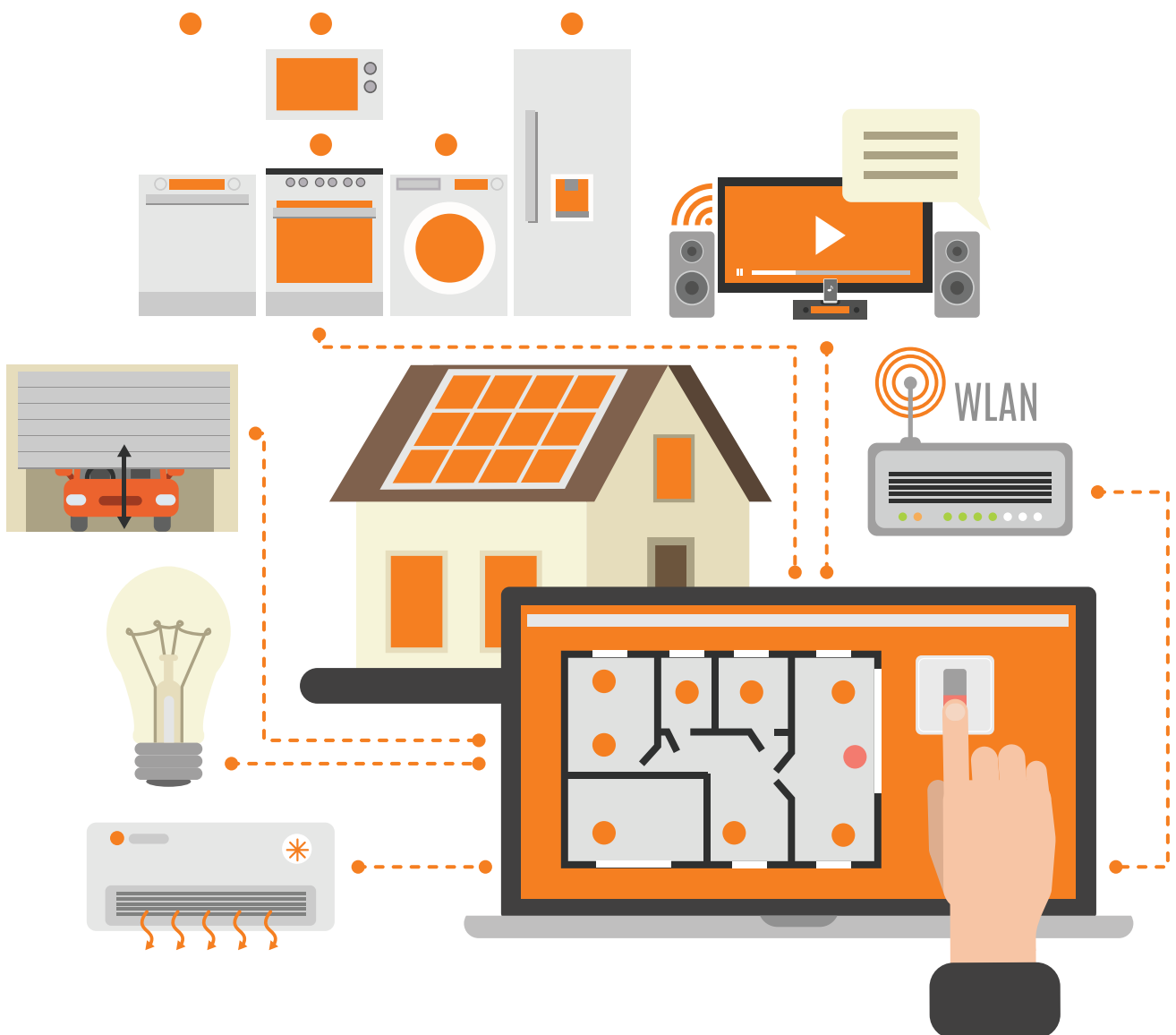# INTERNET OF THINGS

Internet of Things

Internet of Things is a system of interrelated computing devices and digital and mechanical machines fitted with unique identifiers. These systems have the ability to transfer over a network without requiring any human - to - computer or human - to - human interaction. These devices can help automate and control a variety of tasks and processes.

By going hand in hand with machine learning technologies and Artificial Intelligence solutions, these devices can provide significant advantages to both consumers and businesses. IoT does not just make everyday electronic gadgets smarter but also connects them to a broader ecosystem. The IoT ecosystem then helps us understand and control the environment around us, giving us more effective ways of building and managing public spaces. Furthermore, real-time data gathered by IoT can drive analytics and machine learning even further.
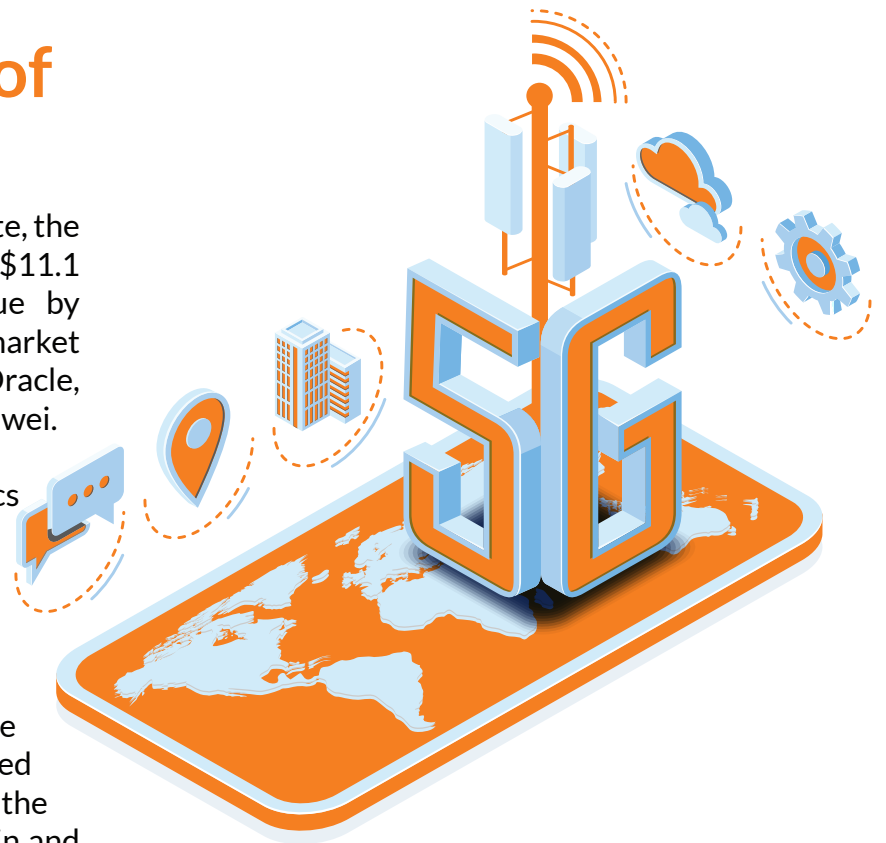
Global Outlook of the IoT Market

As per the McKinsey Global Institute, the IoT market can generate up to $11.1 trillion a year in economic value by 2025.[1]   Key players in the IoT market include IBM, Intel, Microsoft, Oracle, SAP, Amazon, AT&T, Cisco, and Huawei.
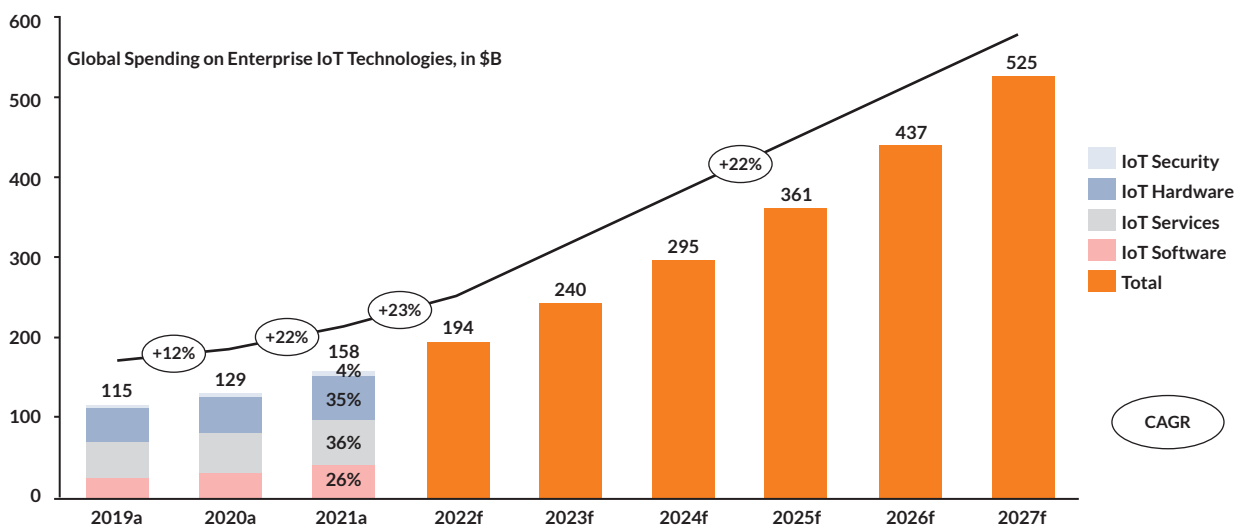
According to the IoT Analytics Global IoT Enterprise Spending Dashboard, the IoT enterprise market grew 22.4% to reach $157.9 million in 2021.[2]

While this was an impressive number, it fell short of the forecasted growth of 24%, impacted by the disruption in the global supply chain and lack of chipsets. The market is further expected to grow at a CAGR of 22% from 2022 to 2027.

Furthermore, the number of connected IoT devices is expected to reach 14.5 million by the end of 2022, driven by a multitude of factors.
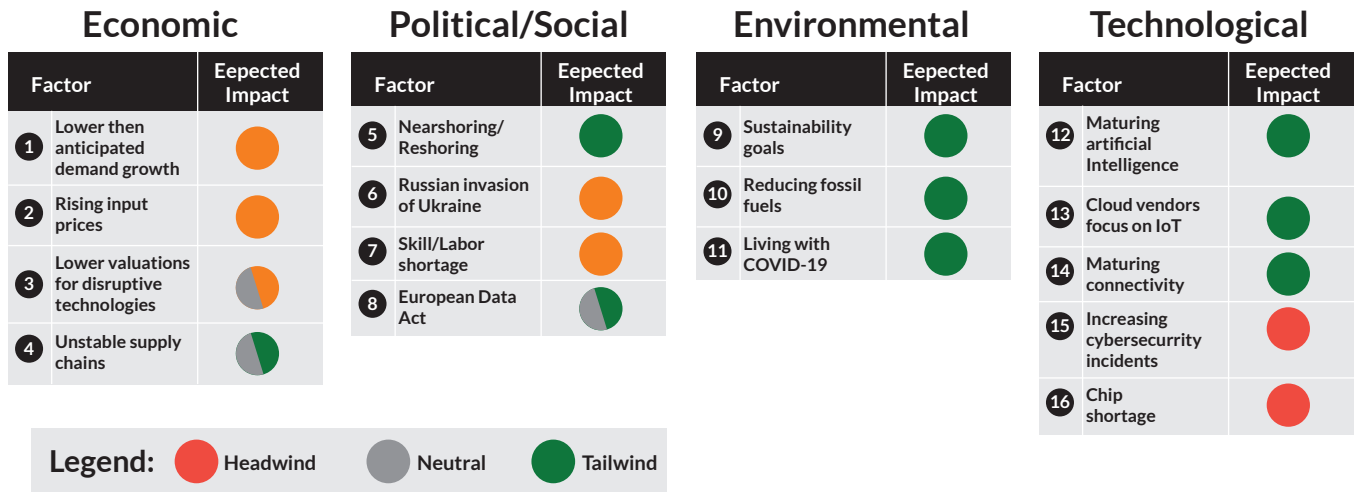
Enterprise IoT Market 2019-2027[3]

Global Spending on Enterprise IoT Technologies, in $B

Year	Total
2019a	115
2020a	129
2021a	158
2022f	194
2023f	240
2024f	295
2025f	361
2026f	437
2027f	525

2021a breakdown: IoT Security 4%, IoT Hardware 35%, IoT Services 36%, IoT Software 26%

CAGR annotations: +12%, +22%, +23%, +22%

Legend: IoT Security, IoT Hardware, IoT Services, IoT Software, Total

CAGR

[1]https://quantoz.com/publications/linking-the-physical-digital-and-financial-worlds/
[2]https://iot-analytics.com/iot-market-size/#:~:text=The%20enterprise%20IoT%20market%20grew,Global%20IoT%20Enterprise%20Spending%20Dashboard
[3]https://iot-analytics.com/iot-market-size/#:~:text=The%20enterprise%20IoT%20market%20grew,Global%20IoT%20Enterprise%20Spending%20Dashboard

Impact of 16 Macro Factors on IoT Markets (2022-2027)

Economic

Factor	Eepected Impact
1 Lower then anticipated demand growth	🟠
2 Rising input prices	🟠
3 Lower valuations for disruptive technologies	◔
4 Unstable supply chains	◕

Political/Social

Factor	Eepected Impact
5 Nearshoring/ Reshoring	🟢
6 Russian invasion of Ukraine	🟠
7 Skill/Labor shortage	🟠
8 European Data Act	◔

Environmental

Factor	Eepected Impact
9 Sustainability goals	🟢
10 Reducing fossil fuels	🟢
11 Living with COVID-19	🟢

Technological

Factor	Eepected Impact
12 Maturing artificial Intelligence	🟢
13 Cloud vendors focus on IoT	🟢
14 Maturing connectivity	🟢
15 Increasing cybersecurrity incidents	🔴
16 Chip shortage	🔴

Legend: 🔴 Headwind ⚪ Neutral 🟢 Tailwind

Source: *IoT Analytics Research 2022.*

The overall IoT market was valued at $384.7 billion in 2021 and is projected to reach a valuation of $478.36 billion in 2022. Further projections place the market reaching a value of over $2400 billion by 2029 if it maintains a CAGR of 26.4%. Since IoT tech functions as a global infrastructure for the broader information technology ecosystem, advancements in IoT are expected to open up new revenue streams and improve the deployment of existing services.[5]

What is Driving the Growth in IoT?

One of the major drivers for growth in this sector is the rise in the concept of smart cities. Everything from Industry 4.0 projects to smart manufacturing requires innovation and growth in the IoT sector. However, due to the numerous applications of IoT that include the collection of data, privacy has become a big concern and is somewhat of a restraining factor in this area.

Based on the end-use industry, the market has been segregated into the following:

healthcare, government, sustainable energy, agriculture, IT and telecom, etc. Out of these, agriculture is predicted to grow the fastest. With applications in precision farming, IoT can help lower costs while increasing yields simultaneously.

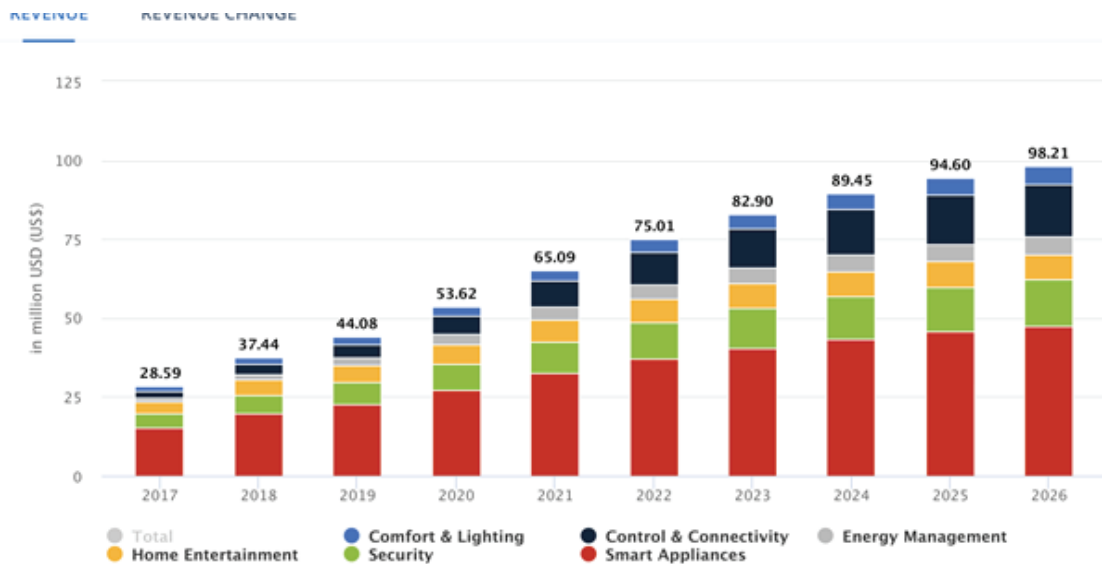Meanwhile, manufacturing and healthcare are expected to have the largest market share during the forecast period. [6]

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[4]*https://iot-analytics.com/iot-market-size/?nowprocket=1*
[5]*https://www.fortunebusinessinsights.com/industry-reports/internet-of-things-iot-market-100307*
[6]*https://www.fortunebusinessinsights.com/industry-reports/internet-of-things-iot-market-100307*
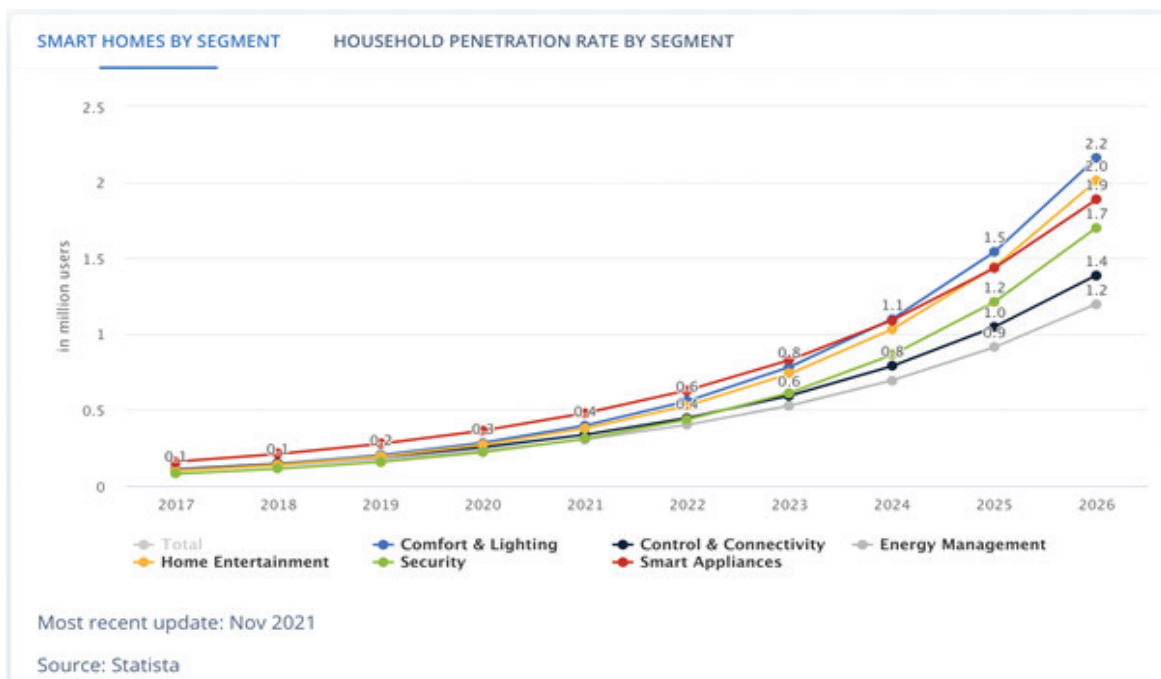
A Look at the IoT Industry in Pakistan

Zooming in on Pakistan, there is much hype around the idea of smart homes in the country. In fact, revenue in the smart home market in Pakistan is expected to reach $75M in 2022, with an expected CAGR of 6.97%. The number of active users in the market is expected to reach 2.9 million by 2026.[7]

REVENUE   REVENUE CHANGE

Notes: Data shown is using current exchange rates. Data shown does not yet reflect market impacts of Russia-Ukraine war; we are currently working on an update.

Most recent update: Nov 2021

Source: Statista

SMART HOMES BY SEGMENT   HOUSEHOLD PENETRATION RATE BY SEGMENT

Most recent update: Nov 2021

Source: Statista

[7]https://www.statista.com/outlook/dmo/smart-home/pakistan#revenue
[8]https://www.statista.com/outlook/dmo/smart-home/pakistan#revenue
[9]https://www.statista.com/outlook/dmo/smart-home/pakistan#revenue

There are also a myriad of IoT projects that are being funded by Ignite-National Technology Fund. One such notable project was called Xbits which allows two internet networks to connect and exchange traffic. Another called CricFlex is described as a 3D automated live batting coach that extracts live 3D human body joint data while batsmen play their shots.

The movement of these joints is recorded in the database and used to extract the best variations for the batsmen who wear them. Another research project called Monolithic CMOS Microsystems for Structural, Chemical, and Bio-Hazard Detection uses a smart fusion of micro-sensor systems to detect biohazard leakages.[10]

To increase the usage of IoT devices in the country, the Pakistan Telecommunication Authority started accepting applications for "Low Power Wide Area Network (LPWAN)" licences in 2022.[11] The year also saw TPL partnering up with Telenor, one of the largest telcos in the country, to provide IoT solutions to the populace in a bid to strengthen the digital connectivity infrastructure in Pakistan.[12]

Meanwhile, the Pakistan Science Foundation and the National Natural Science Foundation of China teamed up to announce the first batch of joint exchange programs. The purpose of the program is to fund 15 pairs of researchers from both nations to undertake a joint research project in different areas, including IoT.

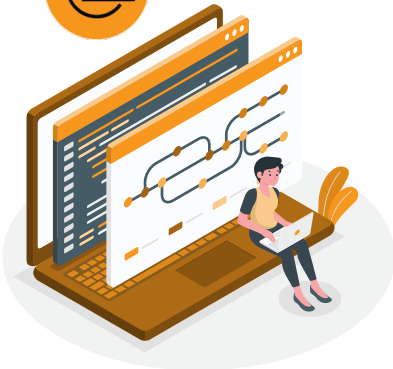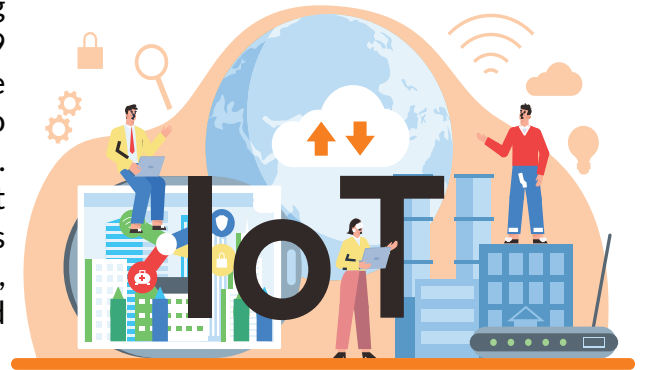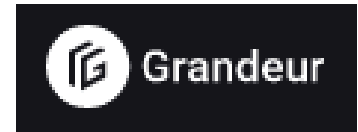| Industry	Companies
Manufacturing / Industrial	Smart Devices, Oracle Pakistan, Telenor Connexion, Bosch, Zong, LinkedThings
Transportation	TPL Tracker, KeyLink Tracker
Energy	SOLHUT, Zigron, Energy N Automation, Telenor Connexion, Electroid, IOTSOL,Okasha, Microsolution, Aayotee, Omni, Smart Homes, Smart Innovations, ZH Automations, GoodLife
Healthcare	Eye-Automate, Xpertflow
Agriculture and SupplyChain	Farm Dynamics Pakistan, Aqua Agro, CowLar, Oracle, SAWie,
Cities	Oracle Pakistan, Folio3, Linked Things, Zigron, Smart Devices
IoT Solution Providers	SOLHUT, KytherTech, Digital Dividend, EvolutionWing, Ioptime, IdeoFuzion, ZWEIDEVS, FiveRivers technology, Metis, FutureAliti, Zlanyk, Novatore Solutions, Pixelon Studios, Developers Studio, ZAPTA Technologies, OraxTech, All-Star Technology, GroCode, Grandeur, FutureAliti, AMS IoT, Techstar Smart Solutions, VeevoTech, VifTech, IOPTIME, TirichLabs, Dot Austere, GroCode

[10]https://ignite.org.pk/projects-completed/
[11]https://profit.pakistantoday.com.pk/2022/05/10/pta-starts-receiving-applications-for-iot-licences/
[12]https://mettisglobal.news/tplt-partners-with-telenor-pakistan-to-offer-iot-services/

Grandeur

Grandeur lets hardware developers securely connect devices to the cloud, store data, and build custom dashboards without provisioning servers and writing custom APIs.They started as an IoT startup in 2019 and wanted to make smart home technology more affordable and accessible to people. In order to achieve that, they designed a $50 smart socket board. It was revolutionary because it enabled users to get the advantages of automating homes and offices without ever upgrading appliances. In 2021, Grandeur raised an undisclosed amount in a seed round from local and foreign investors. [13]

ZWEIDEVS

Zweidevs is a service-oriented company providing creative and innovative solutions for business domains. Its range of services include mobile app development, UI/UX design, IoT, web development, DevOps, and e-commerce. They have completed over 50 projects for more than 20 clients.[14]

IOTSOL

IOTSOL is an IoT Solutions company that makes web-enabled connected devices that are part of an IoT ecosystem. They want to digitally alter workspaces through the engineering and design of native solutions. By leapfrogging into 4iR with seamless integration of cutting-edge technology and a secure work frame in Pakistan, they hope to leverage the norms of traditional industrial operations.Their range of products includes smart switches, smart water monitoring, smart energy monitoring, smart environment monitoring, smart production tracking, and smart water quality tracking.[15]

[13]https://www.grandeur.dev/
[14] https://www.zweidevs.com/
[15]https://iotsol.pk/

OkashaSmart

Okasha Smart provides simple and smart home IoT (Internet of Things) and AI-based home automation devices for everyday use. Their wide range of devices caters to everyday needs of home, office, educational institutes, hotels and industrial automation, security, and energy efficiency. Equipped with the latest cloud computing, Okasha Smart® products are an attractive combination of design and technology which makes them more secure, user-friendly, and affordable.[16]

Aayotee

Aayotee consists of a team of futuristic entrepreneurs trying to create a new world through technology. They aspire to become the largest technology company of the region serving in fields ranging from smart homes to space exploration. They have a multitude of IoT solutions including an IoT power extension. They also provide IoT conversion services for households.[17]

Energy n Automation

ENA is an IoT and power solutions company. Their focus is on providing solutions that help industries deal with day-to-day problems. Their range of services include integration of custom IoT solutions, power management solutions, design of data centers and server rooms, solar solutions, and Building Management Solutions. Some of their clients include Aga Khan University Hospital, Meezan Bank, Faysal Bank, Standard Chartered, DADEX, and Bank Islami.[18]

AMSIOT

AMS-IoT is a part of the AMS group of companies. Like its parent organization, AMS-IoT is passionate about providing brilliant experiences to its customers and enhancing their living standards through engineering, technology, and machine-driven intelligence. AMS IoT's suite of services include custom IoT solutions, hardware development, firmware development, embedded systems, IoT integration and retrofitting, remote monitoring and control, asset tracking, and fleet management.[19]

[16] https://okashasmart.com/
[17] https://aayotee.com/
[18] https://enapk.com/
[19] https://amsiot.com/

Farm Dynamics Pakistan

Farm Dynamics Pakistan is a brainchild of 2nd generation farmers who have been involved in managing family farms since 2000.Their vision is to enhance the agriculture sector of Pakistan by promoting efficient farming solutions through the latest integrated crop management (ICM) technologies. Their IoT solutions include a subsurface monitoring system that measures the moisture and salinity in soil and sends the results to the users, a climate and weather monitoring system, and automated pest monitoring.[20]

An IOT Company

Smart Homes

Connectify Pakistan is a provider of smart home automation and smart business automation services in Pakistan. Connectify delivers an integrated smart home automation and smart business automation system with in-house consultation, professional installation, and support as well as 24/7 customer care. Their range of products include smart WiFi plugs, smart WiFi light strips, smart remote controls, door locks, doorbells, curtains, and dashcam.[21]

Smart Innovations

Smart Innovations is the premier provider of comprehensive, innovative, open and flexible solutions that rapidly integrate the client's requirements through their consulting process. Their solutions are custom-designed and are supported by international standards. Their solutions include smart home solutions, office solutions, and hotel solutions.[22]

GoodLifeTech

Good Life Tech is an IoT startup that focuses on providing value to customers with cutting-edge technology and innovation. They started working on smart devices in 2015 and won a national IoT award in the smart home category later that year. Their Android app also secured 1st position in Pakistan Mobile App Awards held in 2016.[23]

[20]https://fdp.com.pk/
[21]https://connectify.com.pk/
[22]https://smartinnovations.pk/
[23]https://goodlife.pk/

SAWie

SAWiE is offering data-driven solutions to farmers to better manage their farms independently. Their solutions are empowered by remote sensing tools which include Earth Observation and ground-based sensors, adapted to meet the needs of all farm types, especially smallholder farms. They help to improve crop productivity, and yield and gain better returns on investment.Sawie data is acquired from satellites, drones, field sensors, and IoT devices.[24]

VeevoTech

Veevo tech is a technology company working in the areas of business automation, IT, telecom Vas and AI-based IoT products. Veevo Tech has successfully launched a number of products including biometric technologies, scalable load-intensive software designing, SMS/Robo calls solutions, state-of-the-art security solutions, mobile advertisements, and smart electronic gadgets.[25]

CricFlex

Cricflex is the world's first patented wearable technology for cricketers who want to improve their game and make it to the mainstream. An arm sleeve, embedded with sensors, automatically detects an illegal bowling action displaying the results on a smartphone. CricFlex tracks arm force, action time, and amount of spin to determine the player's performance, consistency and effort, ultimately helping bowlers train and improve their performance.[26]

 # GroCode

GroCode delivers end-to-end concept, design, and engineering of innovative digital products, award-winning websites, and disruptive mobile apps. Their capabilities include digital signage, NFC/Beacons, IoT, AR/VR, motion detection, and QR/web triggers. Some of their more clients include Coke Studio, Jugnu, Unilever, Toyota, Dawn, Sehat Kahani, Jambro, and Deaf Reach.[27]

[24]https://sawie.net/
[25]https://veevotech.com/
[26]https://cricflex.com/
[27]https://grocode.io/

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ABOUT THIS INDUSTRY ROUNDUP

Pakistan Software Export Board developed this paper by hiring services of independent consulting firms to prepare this roundup on Pakistan's Internet of Things sector. The paper focuses on Pakistan-based companies in this vertical and apprises the reader of the expertise available in Pakistan in the Internet of Things domain.

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