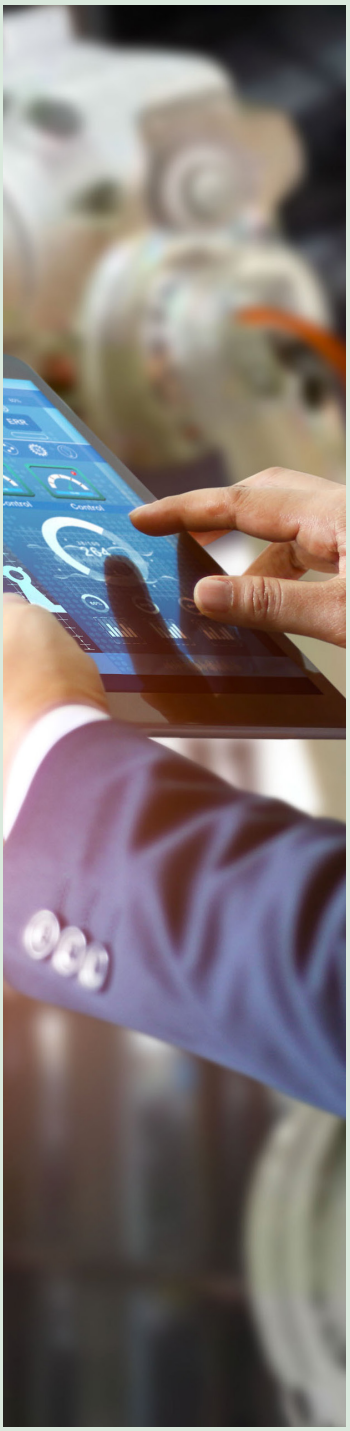
WHITE PAPER



THE ENTERPRISE UAV: THE CASE FOR DRONE INTEGRATION INTO MODERN BUSINESS OPERATIONS

Abstract

Reckoned to register a 19.9% CAGR during the period of 2019 – 2027 , there exists a burgeoning market for Unmanned Aerial Vehicles (UAVs), more commonly called 'drones'. Although initial use cases were largely centered around aerial photography, the drone ecosystem has matured considerably, and today is used within business applications, leveraging AI to make operations faster and more effective. However, implementing drones in the enterprise ecosystem offers its own set of benefits and challenges.

The paper examines the current ecosystem and potential use cases for UAVs across different industries. It also presents a point-of-view on how these use cases can be scaled to global business operations with the help of Microsoft Azure, as a cloud computing platform, alongside integration with enterprise application services such as Microsoft Dynamics 365.

UAVs, along with AI models, image processing, and cloud portals, have raised expectations by enabling easy collection of rich and contextual visual data (without manual intervention), and quick analysis and storage. That's why it's no surprise that many enterprises are eager to integrate UAVs in their operations. The challenges and enablers of UAV integration, as well as a framework for the implementation of UAV technology via collaborative means, are illustrated in the paper.

Infosys®
Navigate your next

Introduction

The inexorable growth of the UAV industry has created a new market of opportunities for enterprises that want to claim ascendency from an operational standpoint. The increased adoption of UAVs by fledgling companies has impacted traditional modes of work. Processes which were once time-consuming, inefficient and sometimes dangerous, are now being made safer, cost-effective & more efficient by UAVs, especially when coupled with other synergistic technologies like Artificial Intelligence, and platforms like CRMs and ERPs.

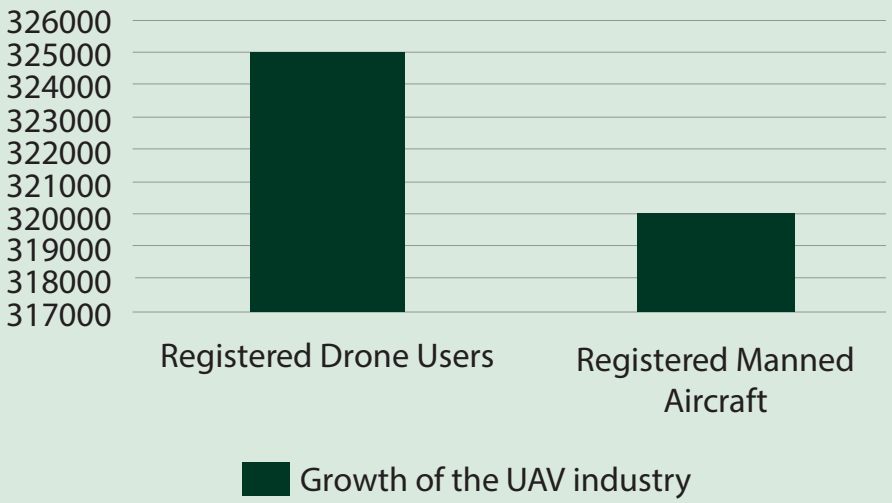
To keep up with proliferating demand, it has become important to leverage the use of UAVs to revamp operations. Experiencing exponential growth in this sector, startups have attempted to define various roles throughout the UAV value chain in a bid to explore new ways to satisfy the needs of the end-user. But within the landscape of UAV implementation, only a few players offer hardware, turnkey inspections, toolkits, training, analysis, or advisory services, which enable businesses to accelerate the adoption of drone technology. Given the continuously evolving nature of UAV technology and legislation, the situation clearly demands an enterprise implementation framework to better integrate UAV solutions with organizational value chains.

The Global UAV Market - Landscape & Trends

The COVID-19 pandemic has brought the applications of UAVs to the forefront. The pandemic has decreased travel while increasing delivery and logistics demands. Despite a looming economic recession, the compounded annual growth rate of the drone industry has been revised to 80.6%. The growing trend of contactless and remote operations in multiple industries has turbocharged the range of applications which can be conducted by drones resulting in a projected market growth of $124.1 billion during the period of 2021-2027 .

Venture capitalists have poured $2.6 billion in drone startups from the beginning of 2012 to June 2019. With much of this capital going into research and development, the industry is primed to make rapid technological advancements.

As per the latest FAA regulations, businesses can now use drones for business operations as long as they follow certain guidelines. Primarily, these guidelines mandate drone operators to obtain drone certification licenses by way of regulated exams. This unburdens the FAA and the Department of Transportation from screening the thousands of business requests to use drones. The FAA also wants to implement a drone-tracking and traffic management system as part of its plan to initiate widespread use of commercial drones. These new regulations will likely spur wider adoption of drones in business value chains.



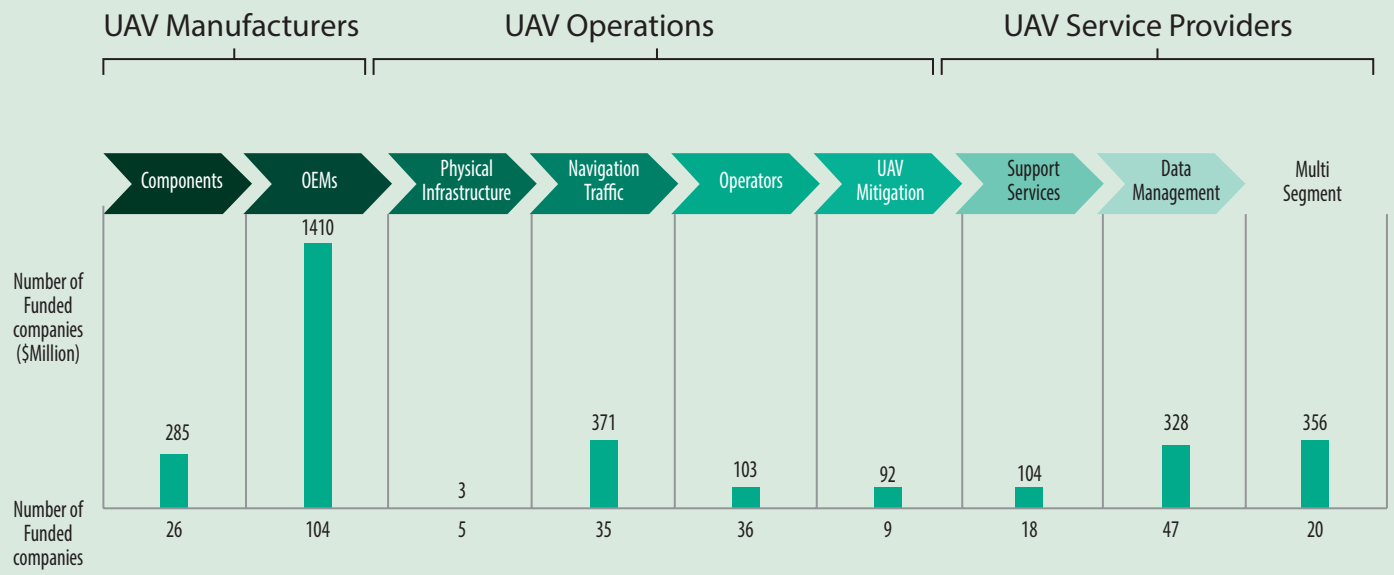
> "The market opportunity for drones is highly evident from the number of registered drone operators in 2016 which outnumbered registered manned aircraft in US."
>
> OHIO University

Since the inception of drone technology, over 300 startups have entered the market, courting investment of over $3 billion dollars to explore new UAV applications. And drone OEMs alone, have received almost $1.4 billion of this overall investment.

But as the industry matures, investors are likely to align toward support services or operations, because end-user companies would increase the demand for turnkey solutions, analytics, navigation, and infrastructure related to UAV maintenance.

Enhanced software allows more accurate insights to be derived from drone-collected data, which in turn would nurture new applications. Some of the use cases for UAVs are fairly obvious, like developing drones to automate deliveries, an inspection of damages by insurance adjusters, spraying fertilizer and pesticide, etc., but for many industries, drone applications are yet to be discovered.

Start Up Funding Across UAV Value Chain



In the value chain for drone-based businesses, we can see that OEMs (commercial and consumer UAVs) have gathered the lion's share of investment as the industry is in the growth stage of the product life cycle; the market has been established, the target audience has been identified and the demand is continuously growing.

To keep up with this demand, distribution channels will be added and due to economies of scale, the per-unit price of UAVs will likely be reduced. Simultaneously, when UAVs are commoditized, companies will try to drive value from services - in fact, by 2050 companies within the ecosystem will derive most of their revenue from value-added services.5

The opportunities are endless, and key stakeholders include system integrators that can help bring the data collected by UAVs to the relevant IT systems, companies offering automation and AI/ML solutions to process the data, software developers creating UI and OS packages for autonomous drone flight control, drone operators and maintenance workers.

Current Challenges Impacting the UAV market

Public skittishness, regulations, and technical complexity are proving to be formidable hurdles to the sustained expansion of the drone industry.

Public Acceptance: Drones make many people feel vulnerable due to potential intrusions into their privacy, security and safety by rogue drones, as indicated by data obtained from United Kingdom Regional Police Forces. This data shows a growing number of drone-related complaints being made by the public11.

The fear surrounding drones creates a significant hurdle for commercial drone operators who need to get permission from landowners so that they can perform surveys, deliveries, and inspections. Additionally, they also face a growing possibility that the public could resort to self-help methods in order to prevent drone activity they disapprove of. This limits agility as public permission and drone flights must be planned well in advance so that the public can be confident that their concerns are being addressed and there are no associated complaints.

Regulations: Although changes to the existing regulatory framework by FAA have accelerated the adoption of drones, a more holistic framework is still required. Stakeholders and investors will need to consider a system to identify owners of rogue drones, track the location of drones and impose penalties on law-breakers.

Today, the regulations for UAVs can be broadly classified into 3 categories - UAV Vehicles, Operators, and Operations.

1. **UAV Vehicles:** Regulators need to consider rules for the identification of operators and UAVs, to ensure that drones are not misused to infringe on public rights. They also need to reclassify certification systems for UAVs, in accordance with maximum take-off weight.

   Currently, FAA regulations allow unmanned drones to be flown without registration if they weigh 250 grams, or about 0.55 pounds, or less. For commercial flight, pilots must go through a rigorous certification process to fly a drone above 250 grams. But DJI's research suggests that unmanned aircraft systems as large as 2.2 kg., or about 4.85 pounds, pose little risk to the public12.

   Hence, there is some scope to further re-categorize Civil RPA in accordance with Maximum Take-off Weight (MTOW) as the current policy also encompasses a wide range of toys and mini drones, further limiting the commercial applications of this technology.

2. **UAV Operator:** The written test format of drone pilot certification by the FAA demonstrates an operator's knowledge of operating requirements and procedures for safely flying drones, but theoretical knowledge does not show the operator's ability to conduct complex drone operations. In order to provide skilled operators, a flight review should also be done to ensure safe flight operations.

3. **UAV Operations:** BVLOS (Beyond visual line of sight) operations, AGL (Above Ground Level) restrictions and airspace integrations are some of the regulations that need to be relooked for long transit operations in uncontrolled space. This would enable drones to collect more data in fewer deployments. The FAA currently requires that the drone operator and a visual observer be close enough to maintain a constant line of sight with the drone. This may limit operators' ability to use drones for remote inspection and assessment. UAVs are also restricted to very-low-level airspace - typically 400 feet AGL which makes inspection difficult if the structure to be analyzed is higher than 400 feet.

Air Traffic Management System: Remote ID technologies built into UAVs will allow security agencies to identify drones flying in their areas to ensure safety and identify rogue drones. The FAA regulation proposal requires every drone weighing over 0.55 pounds to broadcast a signal over specific radio frequencies that would help to track all drones. Often, when internet connectivity is unavailable, operators will have to limit flight to 400 feet laterally which would be an impasse during search and rescue missions, where longer distances are required to be covered.

Infrastructure: As the UAV market matures, the need for advanced infrastructure, including charging stations, landing zones and other assets will only increase. This infrastructure may also include service centers for air taxis, distribution hubs to load and unload goods, and monitoring facilities for drone transport and delivery. In the race to claim prime locations, some enterprises have already begun acquiring air rights or constructing supporting infrastructure. Additionally, a new form of the airport is emerging that can enable vertical takeoff and landing. Unlike traditional airports, these can be built and deployed in small pockets throughout many areas.

Technological Capabilities: For most UAV applications, technological developments that improve battery performance, autonomous flight, and location tracking are still in the pilot stages. Moreover, there exist very few imaging and mapping software which have AI capabilities. To drive adoption, organizations must work on documentation, tracking, GIS data integration, and improving AI-based use cases with the help of workflow integration of drone data and enterprise asset management systems like Dynamics 365, IBM, Oracle, SAP, etc. Streamlined workflow solutions between flight planning, mapping, and drone data processing will advance the use of this technology significantly.

Emergency Protocols & Hardware Failure: Last but not least, situations may emerge where drones malfunction or are not able to reach designated areas. In such scenarios, drone systems must leverage integration with Azure Cloud and built-in IOT sensors to create a notification/work order and make an emergency landing at the nearest station. Furthermore, the task assigned to the drone could be reallocated to other drone operators along with the knowledge base.

UAVs and AI Enable New Operating Models

Today's immense market opportunity has not gone unnoticed. Organizations who want to realize the full potential of UAV technology are integrating them with enterprise applications including CRMs, ERPs, and more.

A key use case of drones, in the enterprise context, is data collection.

By automating and accelerating the process, drones can save significant man-hours. But their true value lies in integration with AI/ML solutions and cloud platforms so that organizations can rapidly extract meaningful output and insights from the collected data.

For example, in Microsoft Azure, the data gathered by UAVs is stored in the cloud (using Azure Blob) and processed by Azure AI/ML to deliver actionable insights directly to a CRM/ERP dashboard.

Industries that frequently need to conduct surveillance, inspection, and delivery activities, should strongly consider integrating UAVs with AI while leveraging a cloud computing platform to build competitive advantage.

Below you will find mature use cases and opportunities within the UAV ecosystem that leverage AI, automation, and analytics across different industries.

Insurance

Smart Claim – Automate Claim process leveraging drone technology to capture Image and AI to improve claim adjudication

Inspection- AI Driven Image Analysis to digitize visual inspection of assets and provide proactive actions to prevent damage

Risk engineering and pricing- AI based aerial site assessments to identify property features to lower overall risk and justify premium discounts.

Construction

Pre-construction: identification of terrain conditions, risks associated with the investment and pre-verification of site

Construction: Real-time site monitoring of the site, 3D modelling

Post-Construction: Regular inspection and detection of defects

Forest and wildlife

Forest fire control and assessment: Drone technology with real-time video surveillance capabilities to monitor, detect and send location alerts in case of fire

Agriculture

Crop Spraying- Leveraging Drones to scan entire field and spray the right amount of water or fertilizer in exact areas

Crop health Monitoring: Transform crop monitoring using AI and real time image analysis to detect diseased part, pest or nutrient deficiency in crops

Wind and Solar

Site Planning and Construction: With the capability to access difficult terrain drone can be used for topographic modelling, soil type analysis and generator proximity

Mining

Volumetric Analysis: Leveraging Drone mapping for the cost effective and efficient way measurement of stockpiles to maintain inventory

Risk Identification: Using 3d models created through drones for blast planning in a mine

Safety: First Responders to accident site and transmit information to rescue team

Ecommerce

Last Mile Drone Delivery: AI-backed drone fleet management framework to reduce the cost of operations by completing last mile deliveries

Transmission and Distribution

Substation Maintenance & Inspection: Using deep learning to understand and process the inspection data from drone and alert in case of surface damage. Posing a special challenge of turning off substation before human inspection leading brief outage for customer.

Site Evaluation: Creating 3D layouts of the site from data collected by UAVs to optimize layouts

Health and Safety

Tele medical Package: Automated Delivery of emergency telemedicine services in areas identified using GIS models

Food & Medical Supplies: Automated drones to deliver urgently needed medical supplies to a number of hospitals and remote quarantine facilities

Disinfecting public spaces: Using drones to spray disinfectant in the fight against COVID-19.

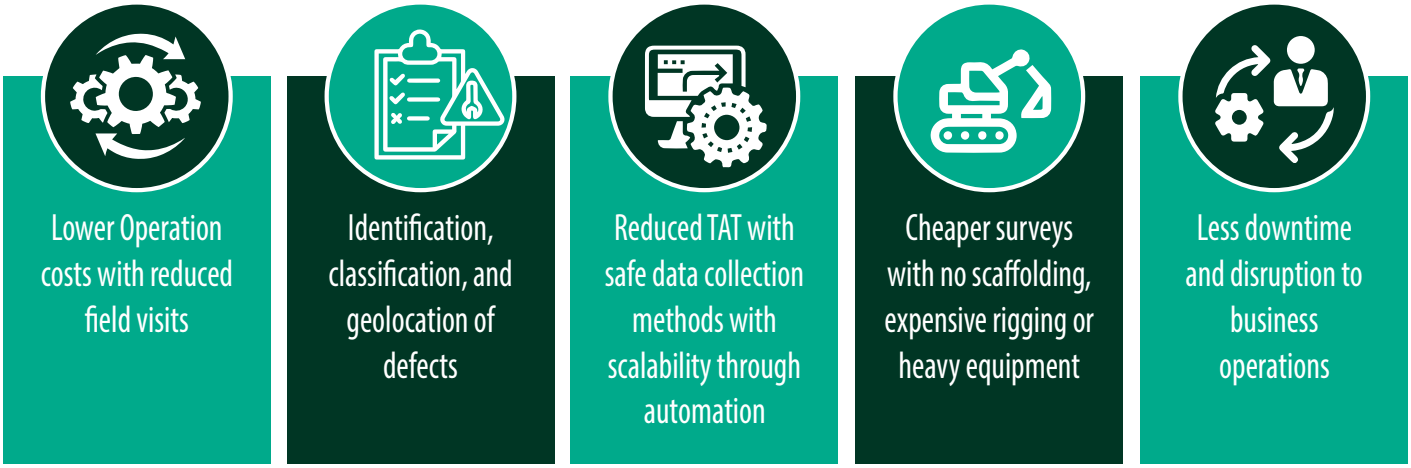
Surveillance and Broadcasting: Enforcing social distancing rules with the help of drone surveillance and broadcasting messages and information about lockdown measures

Empowering Drone Services With Azure

Working with a platform like Microsoft Azure Cloud is recommended because of its developer ecosystem and traffic management capabilities. Besides those benefits, enterprises will also unlock value via the platform's high-volume data engineering capabilities. Azure is unique in that it uses ML and computer vision to pilot the device through complex flight patterns, while simultaneously executing data analysis.

Data and insights generated by drones can be presented in interactive formats via augmented reality, including text, audio and video capabilities with the help of Windows SDK. Incidentally, this is the same SDK that enables Azure AI services to interact with drone data (video and images) in real-time.

In general, drones have the potential to create long-term value for many of the industries listed above.

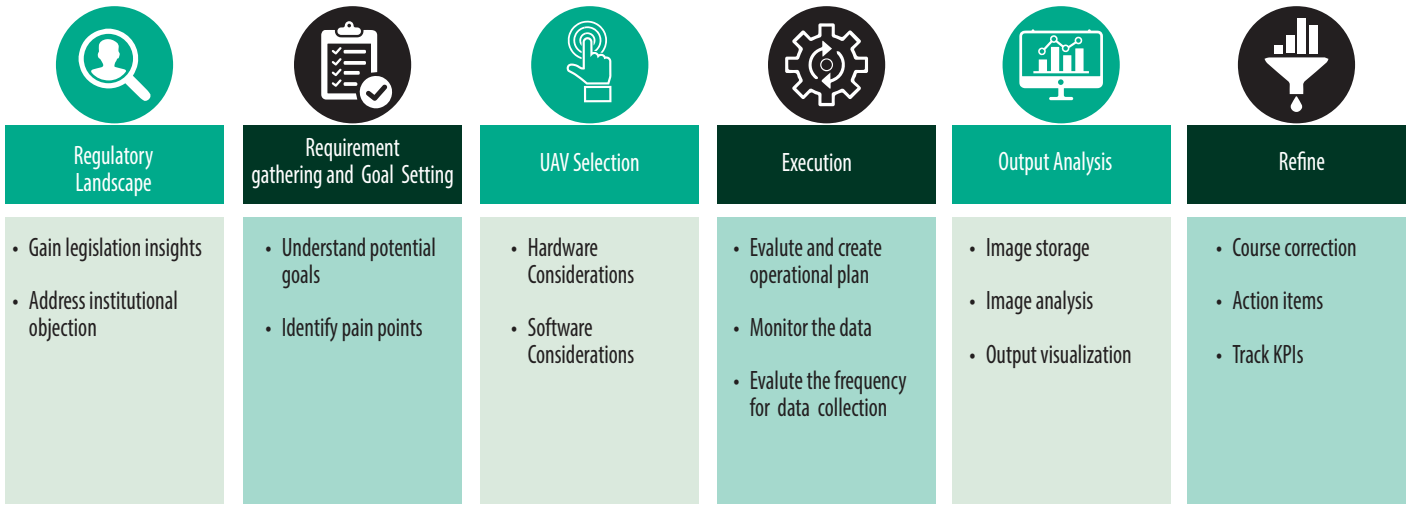


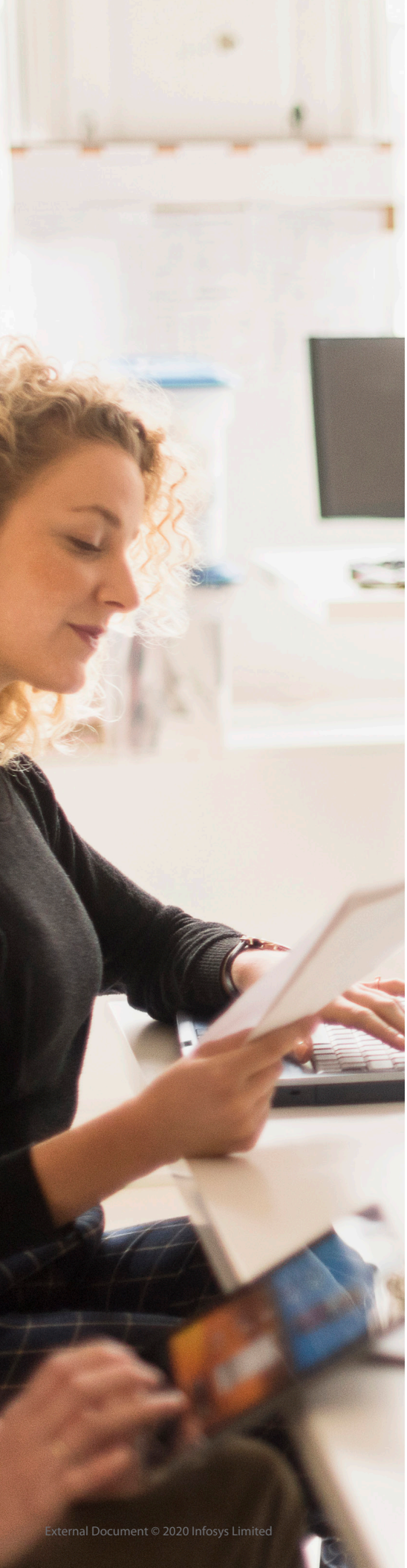
A Framework for UAV Implementation In Enterprises

An organization looking to tap into the data collecting potential of UAV technology must start by identifying the kind of data they want to capture and if drones offer a more efficient solution over existing methods.

Once a clear value proposition has been established, the framework for implementation can be categorized into six phases. Each phase must also be evaluated preemptively, before adopting a UAV offering.

This framework aims to guide the UAV implementation process in organizations and define contextually relevant mission objectives.





- **Understanding the Regulatory Landscape**

  Establish if there are any kind of guidelines/regulations concerning the usage of UAV. As the guidelines would impact the use cases that could be implemented in different industries, it is pertinent to work with legal counsel to obtain rights or address any institutional objections that could be raised.

- **Requirement Gathering and Goal-Setting**

  Discern the requirements across the value chain of the industry for UAV implementation and identify the pain points that is intended to resolve or the business goals that is aimed to achieve. An analysis is prepared that corroborates following points:

- UAVs will meet the potential goal/ address the pain points more effectively than existing methods
- UAVs can accomplish the task efficiently saving either/both time and money
- The use case will provide greater safety to the public and operator
- Operations will involve no greater intrusion than existing methods which have been approved by legislation
- The use case/UAV implementation is scalable and feasible across different platforms and geographies

  Once these questions are analyzed, organizations can also consider using other emerging technologies such as mixed reality, sensor technology, image analytics and 3D modelling in conjunction with UAV systems.

- **Device Selection**

  Choosing the right UAV depends upon the envisioned use case as it determines the type of camera, sensor and device to be used. The approval of the governing body is also mandatory, after which the UAV is presented to the organization for purchase approval. UAV functions which pose a regulatory hazard are disabled or controlled.

Nowadays, UAVs have a plethora of applications such as air surveillance, inspection of utility lines and mapping, monitoring transmission towers, site evaluation, search and rescue operations, etc. For enterprise needs, the most suitable UAV is selected based on the tasks that the UAV is going to undertake and consequently decide whether maneuvering ability and accuracy or speed and long-range is required. Once the purpose of the UAV is determined, the other basic characteristics which should be taken into consideration are:

Hardware Considerations

- **Flight Frequency & Duration**- Determines the range that the UAV will be able to shoot in a single flight. Thus, flight time shows the the economic efficiency of each flight which is considered along with take off weight and carrying capacity.
- **Payload** – The UAVs are needed to be equipped with different types of equipment such as magnetometer, laser scanner, thermal imager, photo or video camera based on the tasks and the result which is intended to capture. The UAV should be able to carry the equipment to the designated area without losing the flight duration.
- **Data Specifications** –As different types of UAVs are good at transmitting and collecting various kinds of images and videos, it is important to consider the imaging output that is required for the task or the chosen use case.
- **Operating Conditions** – Another important feature that is necessary to consider for UAV selection is the weather conditions under which UAV would fly to capture data. Strong wind, rain and temperature can destabilize the UAV and reduce battery life, hence limiting the UAV options that could be considered. Thus, the UAV should be able to withstand wide range of temperature and wind speed.

Software Considerations

- **Software for Data Processing** – UAVs need specialized software for data management, mission planning, situational awareness, or 3D mapping, depending upon the specific task requirement. Ideally, enterprises should limit their options to models where the UAV and the software for photogrammetric processing work in tandem.
- **Execution**

  Once the UAV is approved, an operational plan and user stories should be developed for integration. Prior to implementation, enterprises also need to ask themselves a few key questions. It is important to have a complete understanding of the organizational landscape, including existing architecture, and then consider if UAVs are the ideal method to collect data or if it might be done more efficiently by other means. Another key consideration is to decide on whether the UAV pilots are trained in-house or outsourced.
- **Integration with Touchpoints:** Integration touchpoints are established, and the UAV interface is integrated with Azure cloud computing platform, where all the image/video inputs are uploaded and stored within a data lake.
- **Data Monitoring:** The collected data is monitored, and the raw output is compared with the predicted output.
- **Frequency and Accuracy Validation:** Many times, there is a correlation between the frequency of the data collected and the accuracy of the output. Generally, the more frequent the data collection, the higher the expense and accuracy.
- **Analyzing the Output**

  The rich contextual data is collected, stored, and analyzed with the help of Azure AI/ML engine that delivers actionable insights. Each collection of insights is displayed in the UI, while functionalities are automated across the core business functions of customer service management and field service, leveraging the integration between ERP/CRM.
- **Refining the Process**

  Once the use case has been deployed, the process is refined for continuous improvement. Continuous improvement of the drone is enabled in terms of the defects which the AI/ML could not identify, flight paths, scheduling, etc. KPIs are also tracked continuously to measure how effectively business goals are met.

The Way Ahead

Advances in technology are poised to deliver benefits to every industrial sector, and drones are part of this technological wave. In fact, drones with data gathering capability and IoT sensors are powerful operational force multipliers for a wide range of industries.

In the context of drone operations, McKinsey predicts that, 'within the US the estimated GDP impact is expected to reach $31 Billion to $46 Billion by 2026, making the stakes particularly high. In this rapidly evolving space, the safety, efficiency and cost benefits of drones can help organizations set new economic benchmarks.

UAV proliferation, adoption and evolution has the potential to outweigh potential risks and offers considerable opportunities to tap into new revenue streams.

However, integrating UAVs and AI/ML technology into the supply chain will require collaboration, drive, and expertise across the ecosystem to improve business intelligence. This can be achieved by:

- Establishing a cross-border legal framework for UAVs
- Adapting the air traffic management system
- Creating a mechanism to bring stakeholders together

To help accelerate the growth, the Innovation Team at Infosys is working on various use cases to enable enterprises embark on the transformation journey of UAV implementation in their business ecosystem leveraging Microsoft Stack of services like AI, automation, data management services and analytics for end customers.

These measures along with the discussed framework for UAV implementation establish the right foundation to drive the adoption of commercial drones in the supply chain of organizations.

References:

1. https://www.goldmansachs.com/insights/pages/drones-flying-into-the-mainstream.html
2. https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/drone-bubble-bursts-wiping-out-startups-and-hammering-vc-firms/articleshow/70920094.cms?from=mdr
3. https://fortune.com/2016/08/29/faa-drone-ruling-businesses/
4. https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/commercial-drones-are-here-the-future-of-unmanned-aerial-systems
5. https://www.bcg.com/en-in/publications/2017/engineered-products-infrastructure-machinery-components-drones-go-work.aspx
6. https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/commercial-drones-are-here-the-future-of-unmanned-aerial-systems
7. https://azure.microsoft.com/es-es/blog/building-an-ecosystem-for-responsible-drone-use-and-development-on-microsoft-azure/
8. https://www.nytimes.com/2019/12/26/business/drones-faa-tracking.html
9. https://www.nytimes.com/2020/01/01/us/drones-FAA-colorado-nebraska.html
10. https://www.prnewswire.com/news-releases/impact-of-covid-19-on-the-global-drone-services-market-2020-2027-growing-at-a-revised-cagr-of-80-6-due-to-the-pandemic-301066918.html
11. https://link.springer.com/chapter/10.1007/978-94-6265-132-6_18
12. https://www.digitaltrends.com/cool-tech/dji-study-weight-limit-too-low/

About the Author

Smriti

Senior Associate Consultant with Infosys.

Smriti has 3 years of experience in Microsoft Dynamics field. She is a functional consultant and works on CRM, AI and Chatbot solutions along with contributing to different phases of project and pre-sales activities. Her current area of interest is building new solution and enabling digital experience layer in existing CRM.

For more information, contact askus@infosys.com

Infosys®
Navigate your next