

Drone Services Opportunities in Italian Urban Areas

< Service systems and system thinking >

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ABSTRACT

Purpose –

This paper aims at developing guidelines for drone service providers that are planning to realize their activities in Italian urban areas. In the last few years, the number of drone service providers is increasing with a considerable rate. This trend has been determined by several factors, such as the availability of reliable and robust systems and the capability to exploit the vertical dimension to increase the performance and the efficiency in several activities. The list of activities performed with drones include precision agriculture, small packet delivery, infrastructure and building inspection, aerial photogrammetry, entertainment and leisure video footage, support to law-enforcement. Many activities have a strong link with last generation soft technologies, such as the one related to Internet of Things. Therefore, the business model of drone service providers cannot be associated to a simple “pipe” but it must be considered more similar to an “open platform” where providers and users define custom business solutions. The final purpose of this paper is to describe such model and to highlight solutions, strength, and weakness in this market.

Design/Methodology/approach –

First, the paper describes the set of services that can be carried out by performing a literature review. Main sources will be existing regulations of regulatory agencies, market research, case studies, and web sites of existing providers. Moreover, similar experiences at international level will be addressed to highlight similarities and diversities.

The business model of Italian drone service provided will be discussed by considering available examples, such as the Open Innovation model by Chesbrough. Commonalities and distinctions will be discussed. A focus will be put on the type of service provided. Currently, some activities are more mature than others, such as precision agriculture and infrastructure inspection. The terms that define the level of maturity for a drone related service will be presented including the technology level, the regulatory framework, and the market demand by users.

Findings –

The business model of drone service providers will be described in full details. It will include all issues faced by operators, such as the selection of drones, the procurement of payload, the management of a network with sellers and customers, the fulfillment of regulations, the correct executions of missions, and the adjustment of business to customer request.

Originality/value –

Drone services have just recently developed from pure research activities and pioneer approach. Even if some assessed and structured Italian companies have been developed in the last few years, no detailed model of their business is available in the literature. This paper aims at filling this gap, thus providing guidelines for future operators.

Key words

Drones, Drone services, Internet of things, Open Innovation Services.

Introduction

Drones are a form of technology that have considerably increased its technical maturity level in recent years. In early applications, the capabilities of systems were reduced by several restrictions, such as limited reliability, short autonomy, and reduced payload capability. These limitations have been overcome by exploiting new technologies, such as lithium-polymer batteries, MEMS sensors, advanced materials, and advanced digital signal processors. Several manufactures have developed worldwide drone platforms that are adequate for safe professional applications. In particular, DJY™ and Yuneec™ from Cina, Parrot™ from EU and 3D Robotics™ from US are the most important ones. Their systems are designed to provide adequate features for drone-based services while meeting safety requirements to get flight authorization.

Drones can be used to develop several services, such as precision agriculture, infrastructure inspection, airborne surveillance in support to law enforcement, packet delivery, communication relay, and aerial photography and video for several applications like realty agents and movie producers. A detailed description of services provided by drones including examples of application will be provided in the section “Literature Review”.

It is worth noting that drone is a type of technology that is fully integrated in the set of technologies lending to the 4th industrial revolution concept. Drone manufacturers and drone service providers are usually organized as smart factories that include all the issues related to this type of manufacturing organizations, such as:

- Smart production: drones are usually assembled by end users. Many structural components can be easily replaced. Sometimes, they can be realized at an additive manufacturing station, i.e. by 3D printing. Also, electronic components are usually realized by exploiting open source electronics and software;
- Smart services: the adoption of drones has permitted to realize several applications that required a large effort in terms of cost and time with reduced resources, such as 3D surveys of buildings and land fields;
- Smart energy: drones need to exploit smart energy solutions to overcome their reduced autonomy and range performance. Advanced solutions are often adopted, such as the use of high-capacity Lithium-Polymer batteries and solar panels.

Drones are also a primary source of information for Internet of Things. Several examples of drone derived products can be considered, such as:

- Topographic products including aerial maps;
- Professional and leisure videos;
- Drones will be used for packet delivery of items purchased with e-commerce. This is a plan by Amazon™ and Google™;
- Some companies are planning a drone service-on-demand, such as it happens for Uber cars. Anybody could request in real time a drone for an aerial photography application by means of a smartphone;
- Drones will be used as Point of Access for internet service in zones where Internet access is difficult to be provided by exploiting other systems. There are projects by Facebook™ and Google™ related to this application;

- Internet is planned to be used as framework for future interface communications of drone traffic system. This role will be covered by 4G LTE mobile system.

Currently, the Italian drone service scenario is developing at a fast rate. While some regulatory issues are still open, since regulation for the authorization of operation is changing with time. In the same way, the demand for drone operations is increasing at a fast rate and several companies are developing new business activities. In the following sections, this scenario is discussed in detail to highlight specific issues, organizational model, and opportunities for the Italian drone service business.

Literature review

Several types of services have been considered for drones. Some of them are still at experimental level, some others are more mature depending on the level of risk they rise and, consequently, on the level of technology that must be adopted to let the drones fly safely.

A service that has been provided since several years by using drone is precision agriculture (Tokekar; Vander Hook; Mulla; Isler, 2016). These services have been developed in Japan where drone helicopters are used to estimate the harvesting stage of crops by visual inspection or by using other type of sensors. Moreover, drones are used to spray pesticides over crops. In the past, this function was performed by manned aircraft and it resulted in a dull activity, since it requested to fly up and down over fields to guarantee a proper irrigation. In addition, it was a dangerous job for pilots since the aircraft had to fly at low speed and low altitude.

A typical application for drone is law enforcement. Indeed, the availability of platform that helps to get an overview from above during a law enforcement activity is very helpful to help law enforcement operators to attain better situational awareness. For this reason, several local and national organization involved in law-enforcement activities are planning to use drone derived from military applications to perform patrolling and surveillance (AeronVironment, 2016).

Another task important for public activities is wildlife and wildfire surveillance. Drones are used to perform early detection of fires and to support fire extinguishment operations to reduce the risk of direct contact of human operators with fire (Merino; Ollero, 2010). Moreover, drones are used to detect illegal activities against wildlife so that people that perform this type of activities can be recognized and prosecuted (Gonzalez; Montes; Puig; Johnson; Mengersen; Gaston, 2016).

Aerial photography and, more in general, aerial remote sensing is a useful job that can be realized by exploiting drone. A huge list of end-user can be provided including mapping operators, realty agents, leisure employees, power-line and pipeline owners to monitor line interruptions and fluid leakage, and professional photographers (SenseFly, 2016).

The capability to attain elevated position at low cost makes drone suitable for performing as communication relay. They can be equipped with a proper transceiver or micro-cell payload to provide a radio link between two points that are out of line of sight connection. A similar application has been proposed by GoogleTM and FacebookTM to provide Internet connection for areas that have no line availability (Soundararajan; Agrawal, 2016) (Bonomi; Milito; Natarajan; Zhu, 2014).

Finally, drone are planned to be used by Internet shops for small packet delivery at local level. Indeed, some issues related to safety, autonomy, and allowed payload mass should be addressed but an experimental service has already been provided by AmazonTM (Pandit; Poojari, 2014).

Methodology

In the following sections the Italian drone service business is discussed. First, an overview about Italian Service Providers will be presented. It will include a general discussion related to the types of service developed and the assessment of the size of the Italian drone market. Data acquired from most authoritative sources are presented. Subsequently, specific issues related to Italian drone service business are considered. They include a comparative analysis with respect to international

scenario of drone service providers and a presentation of the relevant business model. Finally, an analytical dissertation of the reported issues will be provided to derive the specific peculiarities and business opportunities.

Overview about Italian Drone Service Providers

Not enough data is available to highlight a trend of Italian market of drone services. However, some information can be derived considering market research related to the revenues of drones sold in the next few years. Figure 1 reports data from a recent report (Marketresearch Inc., 2011). The overall market is increasing at a fast rate and some surveys about drone service providers are already available (DOXA, 2016). These studies derived some considerations related to the distribution of revenues among service providers. About 53 companies are counted and the relevant trend of average turnover is reported in figure 2.

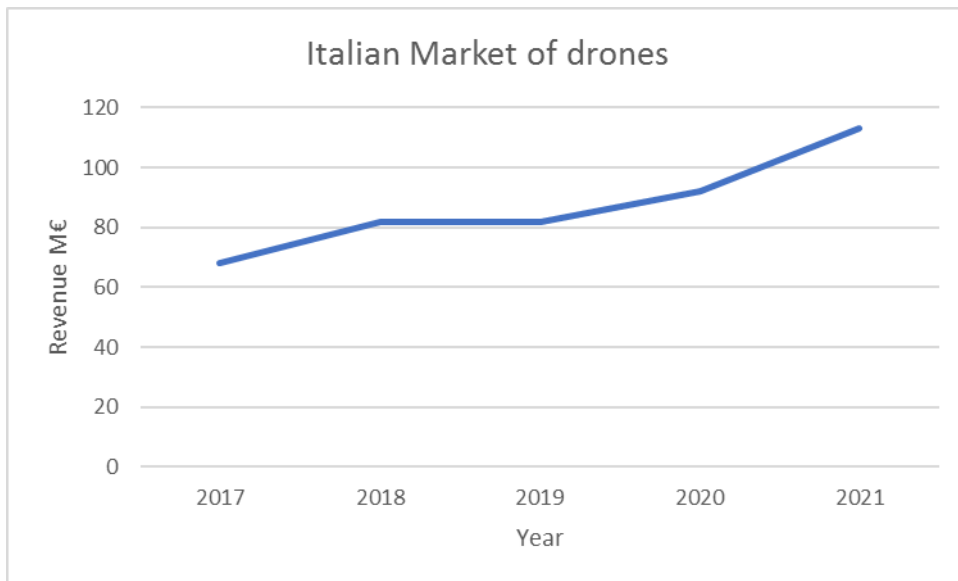


Figure 1– Expected revenues from drones sold in Italy in the years 2017-2021 (Marketresearch Inc., 2011).

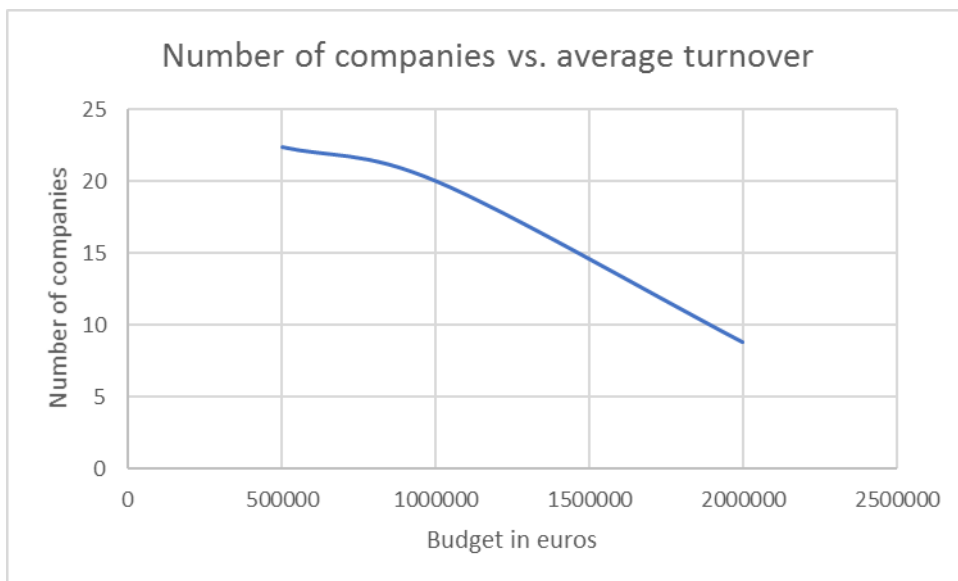


Figure 2 – Distribution of the average turnover vs. companies (DOXA, 2016).

The main activities of interest are summarized in the following list:

1. Agriculture (23% share);
2. Photogrammetry (22% share);
3. Photography and video (15% share);
4. Topography (14% share);
5. Environmental analysis (14% share);
6. Monitoring and law enforcement (12% share).

In the following, four examples of companies are reported to highlight peculiarities.

Company no.1 – Italdron srl

Headquarters: Via Faentina 175/A – Ravenna – Italy;

Number of employees: about 20;

Main activities: Mapping, photogrammetry, precision agriculture, infrastructure inspection – It is also piloting school and drone manufacturer;

Web site: www.italdron.com;

Budget: 0.25 M€(2013) - 1.50 M€(2015).

Company no.2 – Top View srl

Headquarters: Via Alessandro Pertini, 25D - San Nicola La Strada (CE) – Italy;

Number of employees: less than 10;

Main activities: Infrastructure inspection. It is also drone manufacturer;

Web site: www.topview.it;

Budget: unknown.

Company no.3 – Flytop srl

Headquarters: Via Giulio Pittarelli, 169 – Rome – Italy;

Number of employees: less than 10;

Main activities: Photogrammetry, precision agriculture. It is also drone manufacturer and piloting school;

Web site: www.flytop.it;

Budget: 0.3 M€(2014) - 1.00 M€(2015).

Company no.4 – Analist Group srl

Headquarters: Via Aldo Pini 10 – Avellino – Italy;

Number of employees: more than 30;

Main activities: Mapping, photogrammetry, infrastructure inspection. It is also software developer;

Web site: www.analistgroup.com;

Budget: 3 M€(2013) - 5 M€(2015).

As reported, the typical Italian drone service provider is a small company with less than 30 employees and a yearly budget in the order of 1M€ All companies show an increase of budget in the last few years.

It is worth noting that also regulations have an important role in the development of drone services. Indeed, the ENAC, i.e. the Italian authority for the safety of flight, has modified original regulations for small remotely piloted aircraft since July 2016. The relevant modification have determined an impact in the process of authorization of operations and pilot training.

Issues Related to Italian Drone Service Providers

Comparative Analysis with International Drone Service Providers

Figure 3 shows the trend of drone market in US for the years 2017-2021. It shows a similar trend to Italian one with a ratio 1:25 (Drone Industry Insights, 2016). Indeed, US are a large market for drones and the advent of this technology has been anticipated for some years. Similar trends are determined for Europe and Asia/Pacific with proportional magnitude of markets. It is worth noting that a large part of most important drone manufacturers are located in China, such as the world leader DJI™ and the front runner Yuneec™. Indeed, China has received large benefit in the development of drone technologies from two types of issues, such as the simplified authorization framework and the availability of low cost electronics components and parts.

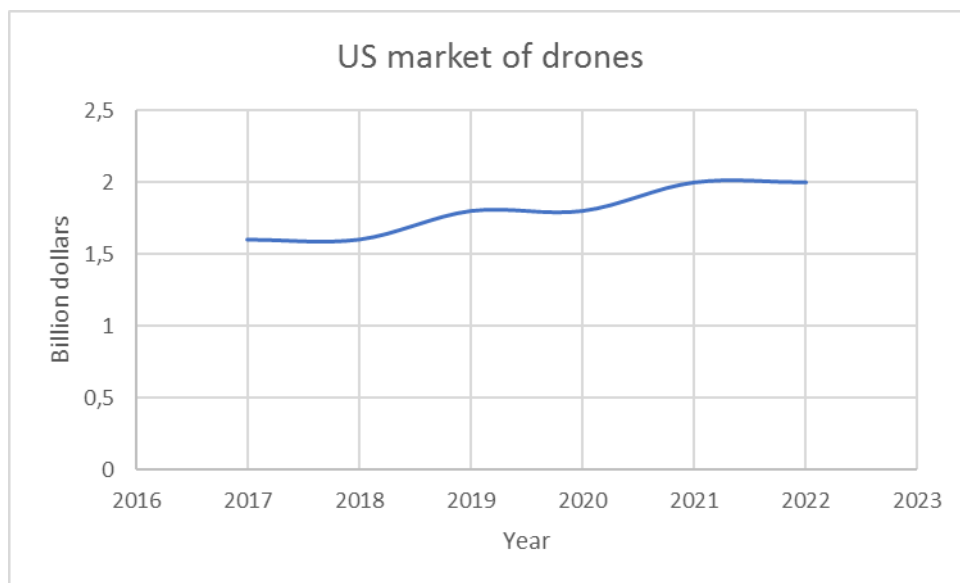


Figure 3 - Expected revenues from drones sold in US in the years 2017-2021

Regarding the type of activity developed, we note that Precision Agriculture is the main source of application for both US and Asia. Japan has developed a large volume of application for passive and active Precision Agriculture applications since several years. Indeed, passive applications are the ones where drones are just used to monitor the status of crops, while active applications are the ones where drones have also a role in the management of crops, such as irrigation or pesticide spraying.

In Europe land surveying and infrastructure inspection have an important role. Indeed, the prevention of issues determined from natural and artificial sources, such as flooding and damages to railroads, pipelines, and electric lines.

In US law enforcement applications are also important, such as border patrolling and fire monitoring. Moreover, assistance to aerial tv footage and movie making is an important application.

The fact that drone technologies have been developed since more time than in Italy has also determined the condition that international companies involved in drone service providing are made by more employees and have larger budget than in Italy. In many applications also network of franchise operators are former to share common issues at centralized levels. In general, drone operators tend to develop societies and communities to support the advancement of their applications. This is a typical condition for activities related to leading edge technologies.

Organization Layout of Italian Drone Service Providers

Figure 3 depicts a reference organization chart for a drone service provider.

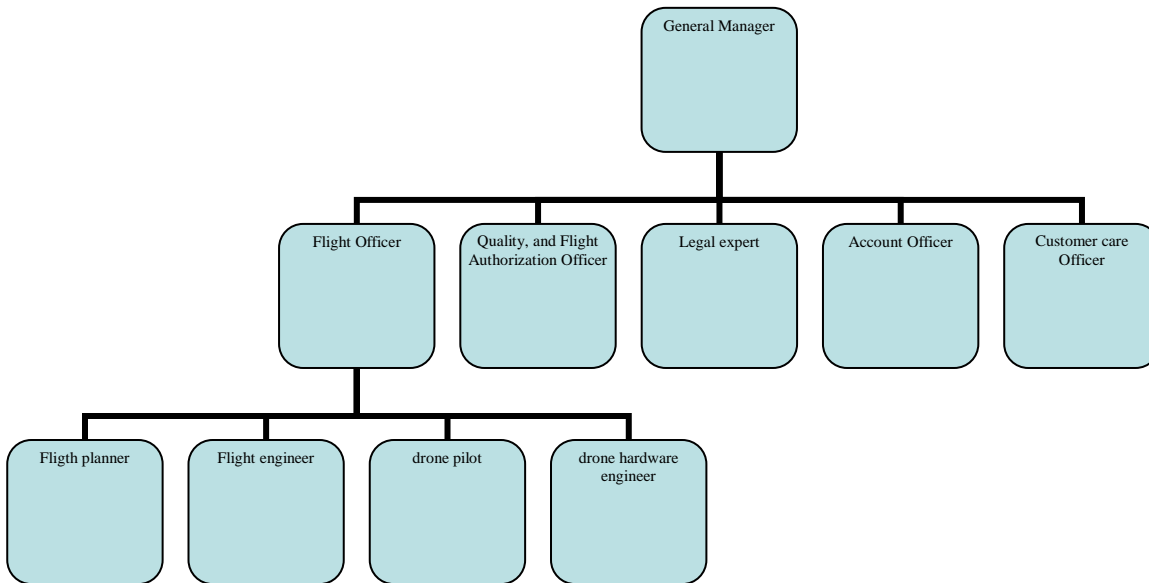


Figure 4 – Organization Chart of a drone service provider

The *General Manager* is the high-level responsible of company activities. This position is dedicated to a professional with an experience of several years in the business of aerial services. He coordinates all the company activities.

At second level six officers are needed, such as:

- A *Flight Officer* who coordinates all flight activities. This figure needs knowledge in air traffic regulations, drone piloting, and drone platform handling. He is responsible of four people, such as:
- A *Flight Planner* who is responsible of providing the flight plan of drone for each service requested by customers. He needs knowledge of air traffic regulations;
- A *Flight Engineer* who develops all pre-flight and post-flight technical activities, such as installation of ground station and pre-flight tests;
- A *drone Pilot* who performs piloting activities during flights. In case of use of several platforms, i.e. fixed wing and rotary wing, or performing long endurance flights, more than one pilot is needed;
- A *drone Hardware Engineer* who performs platform procurement, maintenance, and configuration management;
- A *Quality and Flight Authorization Officer* who monitors and handles quality assurance processes in the company. Moreover, he is responsible of interactions with flight safety authorities in order to attain the requested Certificate of Approval for each operative scenario needed to provide a service to a customer;
- A *Legal Expert* who will be responsible of all legal aspects related to drone operation, such as accident management and privacy issue handling;
- An *Account Officer* who performs all requested accounting and financial activities inside the company;
- A *Customer Care Officer* who manages the interactions with customers.

The above reported organization chart can be used in a flexible form since some figures, such as Quality Officer and Legal Expert, can be covered by a single person if the size of the company is

small. In case the company is large, some figures can be covered by multiple persons, such as pilots.

Discussion

An overview of drone services opportunities and operators has been realized. First, a literature survey has been performed to highlight the main issues and trends in this type of activity. Subsequently, a discussion related to Italian drone operators has been carried out. It included all main aspects for this activity, such as market trends, company description, and activities of interest. Some iconic examples of companies have been presented with all details. Finally, main issues related to the development of drone services have been discussed including a comparative analysis with international scenario and the description of the organization layout of a drone service provider.

In summary, the main guidelines for developing drone services in Italy have been derived. The current reference model is given by a company that has a number of employees in the order from 10 to 20 and a yearly budget in the order of 1M€ They are very technology oriented and usually provides additional products, such as drone platforms itself, software, and pilot training.

If the future scenario will make Italian companies more similar to international ones, larger companies will be needed with a number of employees in the order of 50 and more and a budget in the order of 5M€ At same time, companies will need networked support solutions, such as societies and communities, to provide the level of assistance needed to support leading edge technologies.

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