

Introduction

Imagine a world where autonomous flying objects zip through the air performing menial tasks, for example monitoring crop growth, delivering packages, or inspecting power lines in remote areas. It may seem like something out of a science fiction novel, but drone research and development is the direction many organisations around the world are advancing in, and libraries are slowly awakening to the potential drones have in their spaces.

The aim of this paper is to briefly describe what drones are, how they are currently being used in information workplaces in the United States, and what future applications they may have. Brief consideration will also be given to some of the challenges facing drone development in the United States.

What Are Drones?

Drones encompass a wide range of flying devices with a vast array of applications. Otherwise referred to as unmanned aerial vehicles (UAVs), they are either controlled from a remote location, or programmed to fly autonomously. They come in a myriad of shapes and sizes, but what they all have in common is “a communications link, intelligent software, sensors or cameras, a power source, and a method of mobility” (West, 2015). Drones have their roots in early aviation history (Newcome, 2004), but are mainly a development of military history for use in situations where “manned flight is too difficult or dangerous” (Davis, 2014). Military use of drones is perhaps the most well known example of this. When we hear the word ‘drone’ we often think of an unmanned aircraft swooping into war torn areas, performing calculated airstrikes and swooping out again, all while being controlled from a safe location (Cole & Wright, 2010; Floreano & Wood, 2015).

Drones are not limited to military use, however. Small remote controlled drones are available to the general public for use mainly as toys or for hobby photographers and videographers. A quick search on www.amazon.ca reveals a range in price from under \$100 to well over \$10000 (See Appendix). These recreational drones can be controlled via an app on a tablet, or a remote control and are classified as “remote controlled toy airplanes” (Kroh & House, n.d.).

Drones in the library?

Many of the current uses of drones in the United States involve some kind of monitoring or data gathering function. Over the last decade drones have been used to inspect borders, assist in search and rescue missions, and monitor the weather, in addition to the recent surge in recreational use by hobbyists (West, 2015) but the use of drones in libraries and other information workplaces has not been very widespread. The inclusion of makerspaces in libraries across North America has led to an increase in public interest about technologies that were often previously inaccessible and esoteric, and libraries are attempting to bridge this gap by not only providing access but also offering programming to promote new skills and enhance knowledge building. Libraries are often concerned with improving literacy, not only in the traditional sense but in the multimodal ways we interact with the information in the world, digital literacy being a key component in our increasingly electronic society, and while very few libraries provide access to drones as a means of addressing these skills, there are a few notable examples.

In 2015 the Naperville Public Library in Illinois hosted a community partnership event called Teens Ignite! which offered seventeen different programs including several hands-on STEM-based workshops. One of the workshops included a presentation from Mad Lab Industries, a UAV manufacturer and distributor in the United States, and the opportunity for teens to operate drones and learn about some of the features (Dunford, 2015). Huron Public Library in Ohio hosted a drone video contest in the summer of 2015 as part of Teen Tech Week. Teens were invited to create 90 second videos using a drone lent to them by the library and enter the video in the contest for a chance to win their very own drone. Teen Librarian Mary Olson listed digital literacy as a key factor in considering this undertaking (Iacobelli & Pierre, 2015). In June of 2014, the University of South Florida announced that they had purchased two drones as part of their Digital Media Commons, a space where students are able to work on “high end technology projects” (McNeal, 2014). The University received major attention from many sources over this as they would have been one of the first libraries to lend drones (See appendix). The drones were slated to be made available for checkout in the fall of 2014, but remain

grounded and unavailable even now in 2016 due to regulations put in place by the Federal Aviation Administration (FAA) (Schreiner, 2014; Roldan, 2014). Other universities have had some success working with, and doing research within, the field of drones despite restrictive FAA regulations. For example, the University of Missouri has offered courses in drone journalism, another burgeoning area of drone usage in an information environment, and an introductory drone course that includes flight instruction, the caveat being that they must conduct all drone flights indoors (Cook, 2014). Both the University of Missouri and the University of Nebraska-Lincoln have drone journalism programs that have produced news stories through the use of drones before being ordered by the FAA to desist and apply for a Certificate of Authorization. The FAA currently authorises the use of drones by three means, one of which states that organisations such as universities and libraries, “public entities, i.e., federal, state, and municipal government related organisations” (Pham, 2013), must apply for a Certificate of Authorization before being allowed to operate UAVs.

Despite greater public interest in technologies such as drones, they remain an infrequent inclusion in information workplaces in the United States, due in part to the restrictions the FAA has imposed on UAVs, so what does the future look like in terms of incorporating drones in these spaces?

Future Applications, A Speculative Look Forward

As we have discussed, drones have been used in libraries and universities in only a handful of contexts. In this section we will look at some of the future plans for the use of drones in information contexts.

Many businesses and organisations are interested in the potential drones offer and are beginning to explore potential applications in a variety of settings. Internet giants Google and Facebook have begun the design and testing phase of using UAVs to deliver wireless internet to underserved regions of the world (Warwick, 2015); Google with a secretive project called Skybender that aims to use solar powered drones to deliver faster 5G wireless internet (Harris, 2016), and Facebook with their 140ft wingspan, solar powered UAV code-named Aquila with

the aim of creating a “linked network of the drones to provide internet access to large rural areas (Hern, 2015). Companies such as Google, Amazon, UPS, DHL, NASA, and even Domino’s pizza are delving into the idea of using drones to make deliveries. Amazon is perhaps one of the leaders in this areas and has already developed a prototype drone, branding the future service as ‘Prime Air’, which aims to deliver packages within thirty minutes of ordering. Due to restrictions put in place by the Federal Aviation Administration (FAA), several of these U.S. companies have moved their testing operations overseas to countries with less restrictive UAV flight regulations (Bamburry, 2015; West, 2015). Last summer, NASA assisted with FAA-approved drone medical supply research, delivering medical supplies to a test site in Virginia; “one of many research efforts” to advance the safe integration of UAVs in the national airspace system (NASA aircraft assists in FAA-approved drone medical supply research, 2015).

These examples reflect a shift in the way we will be thinking about and interacting with the world as drone technology progresses, and it is only natural to imagine the extended applications that might be seen in libraries in the future. Digital library collections such as HathiTrust Digital Library and the Internet Archive could be shared with a farther reaching audience with the help of internet providing drones. This would benefit users by providing more equitable access to material and bridging digital divisions, leading to a more informed citizenry; a cornerstone of democracy. Package delivering drones offer a host of potential uses in a library setting, the most obvious being delivery of requested material to users. While everyone may be able to benefit from home delivery, it is an essential service for those with various disabilities or ailments that render them housebound. Couriering material and supplies in transit from one branch of a library to another could result in faster, more efficient service, thereby enhancing the user experience.

Drones also have a variety of applications in a makerspace setting. Not only can programs be designed around them to teach a multitude of hands-on digital skills, they can also be used by amateur photographers and videographers in the creation of artistic projects. Makerspaces already provide much of the equipment required for creative projects, including

cameras, green screens, microphones, as well as the software to edit and complete projects, which makes lending drones a logical next step.

Another idea put forth by Thomas Frey is that of a “borrow an expert” drone; a “flying video screen with a live connection so you can have a brief conversation with an expert who can answer your questions” (2014). I envision this working as a kind of flying reference librarian. It may be situated on the public floor of a library, or possibly patrolling a university campus, and users would be able to interact with an on demand librarian face to face. Roving drones may have further uses in libraries as well, if outfitted with cameras they can be used to patrol corridors, corners, and floors of the library for security purposes.

Conclusion

The potential applications for drones in library and information settings are seemingly limitless, marching us towards a futuristic, almost science fiction-based society. What remains a major topic of investigation amongst researchers are the implications of drone use and privacy (Cavoukian, 2012; Griffey, 2012; Bamburry, 2015; West, 2015) as well as the slow reform process of the FAA in developing rules and regulations regarding UAVs in national airspace (Bamburry, 2015; Floreano & Wood, 2015; West, 2015). The earliest we might see the ubiquitous use of drones in information settings are still at least five to ten years in the future (Floreano & Wood, 2015), but drone research and development is increasing rapidly with many organisations skirmishing to become the leaders in this exciting field.

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Appendix

Sample low and high drone price points

The screenshot shows the Amazon.ca search results for 'drone'. The search results are sorted by popularity. The first row of results includes:

- Syma X5C Explorers 2.4G 4CH 6-Axis Gyro RC Quadcopter With HD Camera** by Syma. Price: **CDN\$ 59.99** (new, 114 offers). It is marked as a 'Deal Seller' in Radio Control Helicopters. Rating: 4.5 stars (145 reviews).
- Hubsan FPV X4 Mini RTF Quadcopter**. Price: **CDN\$ 175.98** (new, 18 offers). Rating: 4.5 stars (97 reviews).
- DJI-P3-Battery Intelligent Battery for Phantom 3 Drones (White)** by DJI. Price: **CDN\$ 214.99** (new, 33 offers). Rating: 4.5 stars (12 reviews).

The second row of results includes:

- DJI Phantom 3 Professional Quadcopter Drone with 4K UHD Video Camera +Black Backpack Bag + Propeller Prop Guard...** by DJI. Price: **CDN\$ 1,720.00** (new, 1 offer).
- DJI Phantom 3 Professional Quadcopter Drone w/ 4K UHD Video Camera & Manufacturer Accessories + Extra DJI Battery...** by ZoomElectronics. Price: **CDN\$ 1,999.99** (new, 1 offer). Rating: 4.5 stars (2 reviews).
- DJI Phantom 3 Professional Quadcopter Drone w/ 4K UHD Video Camera & Manufacturer Accessories + 32GB microSD Memory...** by ZoomElectronics. Price: **CDN\$ 1,799.99** (new, 1 offer). Rating: 4.5 stars (2 reviews).

The left sidebar shows filters for 'Refine by' (Amazon Prime, vPrime), 'Featured Brands' (Syma, Hubsan, Holy Stone, Bestpriceam, BTG, Gemtec), and 'Avg. Customer Review' (4 up, 3 up, 2 up).

The screenshot shows an Amazon.ca search results page for the keyword 'drone'. The page is in French, with the search bar containing 'drone' and the results sorted by 'Price: High to Low'. The search results are displayed in a grid format, showing various drone-related products. On the left side, there is a sidebar with navigation options and a 'Featured Brands' section. The main content area displays several product listings, each with an image, title, and price. The prices are listed in Canadian Dollars (CDN\$).

Search results for **Electronics** (Sort by Price: High to Low)

1-24 of 3,450 results for **Electronics**

Show results for **Electronics**

- Accessories & Supplies (1,500)
- Audio & Home Theatre (12)
- Camera, Photo & Video (1,212)
- Car & Vehicle Electronics (32)
- Cell Phones & Accessories (564)
- Computers & Accessories (70)
- GPS & Navigation (11)
- Headphones (3)
- Office Electronics (13)
- Portable Audio & Video (28)
- Radio Communication (3)
- Security & Surveillance (10)
- Telephones & Accessories (10)
- Televisions & Video (15)

Refine by **Amazon Prime**

Prime

Featured Brands

- Syma (75)
- HubSan (22)
- Holy Stone (4)
- Bestpricecam(TM) (7)
- BTG (1)
- DJI (292)
- Genert (191)
- [+ See more](#)

Avg. Customer Review

- ★★★★☆ & Up (230)
- ★★★★☆ & Up (275)
- ★★★★☆ & Up (292)
- ★★★★☆ & Up (113)

Drone

Product listings shown:

- DJI Inspire 1 PRO Drone with Single Remote Controller & Lens by DJI
CDN\$ 12,883.22 + CDN\$ 9.54 shipping
Only 3 left in stock - order soon.
- DJI Inspire 1 with Dual Remotes PLUS GoProfessional Case PLUS 2 64 GB Class 10 SD Card Plus DronesEtc Lanyard by DJI
CDN\$ 11,550.00 + CDN\$ 84.56 shipping
- DJI Inspire 1 Pro Dual Remotes Zenmuse X5 4K Camera Quadcopter Extra Battery with Complimentary Wireless Bluetooth... by DJI
CDN\$ 9,975.12 + CDN\$ 48.20 shipping
- DJI Inspire 1 Production Bundle By Drones Made Easy (Dual Operator) by Drones Made Easy
CDN\$ 8,091.16 + CDN\$ 84.56 shipping
- Lotus RC Thruster Boom Pre-Wired for T580P Quadcopter
CDN\$ 7,751.26 new (2 offers)
Manufacturer recommended age: 14 - 15 Years
- DJI Inspire 1 PRO Quadcopter with 4K Video Camera + Zenmuse X5 - Single EVERYTHING YOU NEED KIT + Hard Case + ... by DJI
CDN\$ 7,663.50 + CDN\$ 48.20 shipping