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Introduction

Technology has impacted on the library and information (LIS) profession more than most sectors (The New Media Consortium, 2015). Every facet of the industry has been affected in some way by technology including search, teaching and training, scholarly communications, discovery and information storage.

Development of digital tools in the LIS environment has created a wealth of opportunities to improve how we work but it has also brought with it several threats and highlighted weaknesses. We now have a myriad of digital tools to help LIS professionals help others, but do they know what those users really want given the expanding number of problems and solutions? The learning technologist community never stray too far away from pedagogical theory as to why a technology is adopted to assist the teaching process (Lawless and Pellegrino, 2007) (Koehler and Mishra, 2005). LIS professionals approach their problems from an information and digital literacy starting point. Yet that practice only extends so far when considering the adoption of a new tool for teaching, research and dissemination.

The reactive and proactive aspects of technology adoption.

The drivers of technology adoption in the LIS environment can be split, for the most part, into two strands. The first of these drivers is a reactive response to the needs of individuals and organisations whilst the other which is a proactive focus based on horizon scanning for potential and esoteric solutions. Technology change that is reactive occurs when a LIS service reacts to the needs of individuals and the organisation it supports. This kind of technology adoption occurs when an organisation becomes aware of a widespread need to satisfy certain organisational needs (Hsu et al., 2019). This may be a library catalogue or a platform for hosting research data. The second change, less notable at a macro level, through technology occurs through proactive engagement by LIS professionals who seek inventive and new ways to improve or support a working environment or service. The adoption can be proactive, as in that individuals identify a problem before it has reached the wider community and look to find a solution before the problem takes hold.

Reactive and proactive approaches to technology adoption in the LIS environment are not without their issues. The constant influx of new platforms and digital tools means that the LIS professional can be in a constant state of hunter-gatherer mode for the best new technology to experiment with. The sheer number of new technologies can have a snow blinding effect on those exploring new ways of applying them in the organisation which in turn can have unhealthy consequences (Lee, Son and Kim, 2016). Two factors that decide whether a technology is adopted are its perceived usefulness and ease of use (Davis, 1989) and adapted shortly after by (Davis, Bagozzi and Warshaw, 1989). Technology adoption within the environment LIS professionals support is no different to any other setting as highlighted in the Diffusion of Innovation theory popularised by (Rogers, 2003). Every new technology goes through the Diffusion of innovation curve starting with the early adopters through to the laggards. The diffusion of technology adoption's four key elements is the innovation itself, communication channels, time and a social system. Whilst technology adoption at an organisational level can be stifled as inertia takes hold and decision by committee slows down any speedy and impactful changes. Consequently, LIS Professionals can make changes to how they work using technology on an individual level easier than at an organisational one which can lead to problems. Most notably that without proper critical

appraisal of technologies, LIS professionals not only run the risk of using the wrong tool for the task but also expose unnecessary threats to their colleagues and organisation unless they guard against it (Jansen et al., 2016).

At the organisational level there are issues relating to not understanding the spectrum of needs of individuals and groups they serve. Work by (Jansen et al., 2016) into influential user experiences in successful and unsuccessful technology adoptions was significantly affected depending on “perceived usefulness, the fulfilment of psychological needs, and the salience of negative emotions in the most influential user experiences of successful adoptions, and by perceived usefulness, output quality, and the salience of negative emotions in the unsuccessful adoptions”. This is not a problem exclusive to the LIS profession as it can happen to any support service using technology, such as IT or finance. Negating this problem requires a compassionate and good understanding of the needs of individuals and groups within the wider organisation. This understanding is easier to achieve on a micro level as individual needs, that are often esoteric or bespoke, can be met through direct discussion and feedback with LIS professionals.

We need to ask more questions of our technology

Technology has permeated into every corner of the LIS world but as with digital adoption in every other facet of life, are we asking the right questions as we use it in a professional setting? Most notably, are we considering and serving what technology adopters really need? This is not a question exclusive to the library community, it is more pertinent to ask this within computing services as they provide much of the core IT support services within an organisation. However, it is important to remember the overlap and collaboration between both domains and how they often work in tandem to support an organisation. In the LIS community, as with teaching and research communities, there is a greater adoption of open source tools (Payne and Singh, 2010) and small technology start-ups. As with technologies post Web 2.0 (Tattersall, 2011) they have certain characteristics with some of the most notable tools freely available and specialist. This reflects the needs of LIS professionals and the groups they support which are esoteric but under increased capacity and financial strain. The flip side of this abundance of technologies is that they may offer limited service agreements, customer support, security, data protection and updates. Adoption of some open source and free tools offers little or no problems as the technologies are used on a surface level with little or no risk to the organisation. Tools that are used to teach, straw poll, create infographics or videos are unlikely to interact with sensitive data. Nevertheless, the problem arises when individuals do not undertake due diligence over potentially harmful technologies that capture sensitive personal or organisational data.

Using technology on face value

The threat of open source and free tools becomes magnified considerably when the LIS professional promotes untested technologies in their teaching and therefore increases the uptake of potentially harmful technology to users who adopt it on face value. At this stage the adopters could be forgiven for thinking reasonable efforts have been made to highlight any issues with the technology. Examples could include Drop Box, Google Drive, Survey Monkey or email extension and management applications. These are all very effective tools at assisting LIS professionals to carry out work, host information and collaborate. They become problematic when the wider organisation has no formal contract with the technology

platform. Secondly the stakes are raised somewhat when sensitive data is stored on them and shared across unsecure networks or harvested by such as unsecure email extensions. That problem exasperates considerably when the technology is advocated and shared by the LIS professional through their teaching or over social media, email and distribution lists. It can become incredibly attractive to find workarounds to organisational issues that are created by the lack of an in house technological solution. Once a technology solves a problem then other issues can be sought resolution through similar methods of going outside of the formal IT structure. This for the most part is harmless as not every organisation has their own YouTube, Blogger, Prezi, Slideshare or Mentimeter platform to name but a few. Rarely these technologies are hosted within an organisation so there is a strong argument for their adoption. Organisations such as the NHS have been slow to adopt new technologies (Honeyman, Dunn and McKenna, 2016), including tools for communicating with the rest of society through the means of video and social media. This lack of adoption can lead to a culture of inertia, risk aversion and problems with staff development.

The false utopia of choice

There are other organisational technology problems that are mirrored in modern life. One of the more recent ones is that of choice and the sheer wealth of it. We are inundated with a myriad of choices and decisions daily, often about the most trivial of things. Supermarkets offer many variants on simple food products, whilst how we listen to music has diversified across thousands of platforms in addition to traditional analogue and digital hosts. The LIS profession has access to an inexhaustible number of tools that can be applied within scholarly communications, teaching, marketing, search and analytics among other areas of activity. Work by (Bosman and Kramer, 2015) highlighted the depth and breadth of websites and tools used by those in the academic community to help carry out and disseminate their research. The simple task of hosting a preprint paper or dataset has many suitable and unsuitable options, all with their own pros and cons. The first point of call should always be to look at what in house solutions are available and utilise them, but not every organisation is as well serviced as they would like to be. To some extent the variety of choice of tools that assist in creating posters, presentations or infographics is a good problem to have, but it is not so straightforward. On the surface these tools can appear similar but often have hidden problems lurking under the surface. This is especially so with free tools to help generate creative content. The problems, although not serious, can be frustrating especially if time is invested in the technology before they are revealed. Tools that assist in creating such as infographics often have a basic free model that allows users to generate their own content easily. The typical learning curve for these technologies is for the most part easy which again helps with their appeal. Yet time can be invested in creating content only to find the export options limited. Hours can be spent creating a complex and attractive poster only to find you are unable to export it in the format or dimensions suitable for printing on a large scale. Whilst templates are also limited for infographic tools, they do offer flexibility, although frustrations can arise from the limited number of useful icons and images you can access. This is not all bad news as there are a variety of free and Creative Commons licensed images and vectors that can be sourced under the correct attribution.

The Pandora's Box of technology

New technology in a LIS environment offers the promise that we will work smarter, more creatively, carry out tasks faster and with greater success and impact. The problem is that we can seek new technologies in the same way a magpie chases a shiny object for its nest.

Each new technology comes with a set of questions that we can sometimes fail to ask in order to be an early adopter. As discussed earlier, it is important to remember that not all technology is created equal. When considering digital tools, it is sometimes important to think of them in the same way we treat physical tools in a toolbox. Some of these tools may be used once in a lifetime such as sharpening stone whilst others are used every week like a screwdriver. Some tools can be used many times for different tasks such as a drill for making holes to thread string through or hold a rawl plug and screw. In a digital setting you may use a voting tool like Mentimeter just once, whilst a creative tool like Canva several times to create social media content and promotional posters and learning materials. Your digital tool box can be like the physical one in that you are limited as to the number of tools you can store and manage. The more digital tools you learn how to use, the more you must remember and educate yourself about when new versions are released. Therefore, it becomes important to consider this when you are building up a portfolio of technologies. The yearly list of Top Tools for Learning (Hart, 2018) is always a good place to work from when exploring technologies to embed in your tool kit.

Gatekeeper or poacher - what is the librarian's role in technology adoption?

It is often the case that those supporting others in the LIS community learn by their own mistakes. This in turn saves the users they support by being aware in advance of pitfalls, this is especially important given many users go to librarians first for advice. This may be a problem that can be solved with the use of a technology or advice on the technologies they have found themselves and need a second opinion.

Technology adoption for the LIS professional occurs at a different pace as it does for those they support (Rogers, 2003). There are times when it is fine to act like a 'bull at a gate' and charge into the using the technology straight away, especially if the cost-benefit is visible and positive. Approaching transient technologies in a speedy manner is fine as it may just be used to support simple, one-off tasks that need urgent attention. Whilst bigger problems that require substantial solutions can require considerable thought and research. Some technologies require a 'just do it' attitude whilst others may require a SWOT Analysis or business case especially if an investment is needed. It is key that the LIS professional does not approach every technology as a bull as this can lead to trampling over potential issues further down the line as discussed previously in this paper.

Understanding the user's perceptions of technology

The LIS technology champion, although not always recognised, is an essential pillar of the for the community they serve. Often this community may not pay the level of attention to new tools and developments which they can benefit from. The LIS professional may not be the gatekeeper to technology, but they are often a technology expert, curator, advocate and enabler (Arif and Mahmood, 2012) (Maceli, 2018). The problem for the LIS community is that they are increasingly competing for attention with their messages in a crowded and noisy space. The competition comes from other departments and individuals who all have their vested interests and reasons to be heard. This can create quite a cacophony of noise for those on the receiving end trying to carry out their work. It becomes much easier to shut down the messages when they come in such numbers that important ones go unheard as filters are turned up. The LIS professional or their service may have interesting news in relation to new technological developments that could have a positive impact on those they serve. This however can be lost in the stream of messages that appear in a user's inbox

over the course of a day or week. Therefore, it becomes important for the LIS professional to consider firstly the environment they are in and alternative systems to engage with it. The environment in any modern organisation changes regularly and so do the demands on those working in it. The priorities of the individuals that LIS professionals serve can be very misaligned and the new technologies on offer may not help them achieve those goals. For example, a typical researcher's priorities are to produce research papers, win funding and gain tenure and promotion. If the technology, on offer does not help them with those priorities then these messages may not make any impact. The researcher may not realise that there are technologies that can help them carry out their research, databases that provide funding information and creative technologies to help them communicate their work and raise their profile. The blanket approach of email works only so well and other tactics must be employed. Running face to face sessions, using technology to create examples and case studies of what they can do with the tools are just a few ways to try and entice the user to explore technology adoption. Running short introduction bite size sessions (Tattersall, Beecroft and Freeman, 2013) and even trying to arrange one to one meetings or coffee catch ups are a good way to reach users. Once attention is gained it creates opportunities to highlight other technological solutions and in turn create your own network of champions to assist technology adoption in an organisation. The sad truth is that a service's users may not be as excited by rss or a data visualization package, but by showing them how they can actively and positively use it in their work they may start to pay more attention.

Conclusion

Whilst technology continues to develop at the speed it presently does the opportunities will continue to grow, but so will the threats. Therefore, it is important to consider the decision making as to which technologies LIS professionals and their users adopt, as this has an impact much further down the line. Generating content and promotion tools that no one will use or benefit from is a false economy of time and effort. Taking time to have conversations with peers, networks and users can maximise technology uptake further down the line. Technology can be adopted on face value, but key questions should always be asked, especially of open source and free tools. Questions that include:

Who owns the technology?

When was it last updated?

Are they on social media and posting updates?

Will they extract personal data?

Can I export and import my own information?

Has been around for long?

It is important not to become too attached to an open source or free technology as one day, perhaps tomorrow, it could be gone. When encouraging others to adopt a technology to carry out their work, consider the sage advice given by Microsoft principle founder Bill Gates. "The advance of technology is based on making it fit in so that you don't really even notice it, so it's part of everyday life".

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