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20. QR CODES

The Canary in the Coal Mine

INTRODUCTION

Museums are at an exciting intersection of pedagogical reform, technological innovation, and new museology – the reframing of the museum as an educational tool for the betterment of the local and global community. Museums are therefore poised to be leaders in the use of educational technology to support lifelong and informal learning. For example, the 2015 *New Media Consortium Report* calls for museums to develop long-term digital strategies to guide the integration of new technologies, and studies show that a majority of museums are working to incorporate new technologies to enhance educational opportunities (Johnson, Becker, Estrada, & Freeman, 2015; Axiell, 2015).

Although the future is promising, many museums have had a rocky relationship with digital technology in the past. This chapter traces the trajectory of a single technology – Quick Response (QR) codes – and their implementation in museums across Canada. QR codes are two-dimensional barcodes read by smartphones. Distinctive corner markings allow scanners to read the codes horizontally or vertically. QR codes are easy and inexpensive to produce, and a variety of free QR code generators exist online (Massis, 2011). Despite being cost-effective, QR codes have suffered a loss of popularity due in part to technical drawbacks including varying app designs and reliance on Wifi or data plans.

This rise and fall of QR codes highlights that there are many lessons to be learned from past attempts at technology-integrated learning in museums. Specifically, despite technical shortcomings, some museums have used QR codes to innovatively link new approaches to adult and continuing education with new museology, however a variety of social and organizational obstacles have prevented this fusion from becoming widespread. I argue in this chapter that by identifying and mitigating the organisational, educational, and technical roadblocks that have halted effective technology-supported education in museums in the past, museums can move forward to create innovative digital strategies that engage visitors while combining adult education, innovative technology, and new museology.

D. E. Clover et al. (Eds.), Adult Education, Museums and Art Galleries, 243–255.

BACKGROUND

My research on this topic of digital technology began in 2012. At that time, QR codes were receiving significant attention, and some Canadian museums had begun testing QR code programmes. My intention was to assess the QR codes being tested in museums, and to make best practices suggestions based on the findings. Eight institutions were involved in interviews and were surveyed regarding their codes. But by the time I had completed the research it was clear that QR codes had lost momentum. Journalists proclaimed the death of QR codes, lauding the technology as "a meaningless time sucker" (Avrahamy, 2014, para. 3) or "more outdated than your pog collection" (Jones, 2015, para. 1). The debate regarding QR codes' relevance and survival is ongoing, but museum professionals generally seem to agree they are not the next big idea. In reflecting on the data I had gathered, I realised that the trajectory of QR codes in museums provided an opportunity to understand more about how museums approach and implement educational technologies. In this context, QR codes might just be the canary that had to die before we could understand the underlying issues at play.

A body of literature concerning QR codes in museums already exists, and most writers conclude that QR codes failed in museums for the same technical issues that caused them to fail in marketing. Internet access issues, advertisements, webpages not optimized for mobile screens, and the need to download an external app to read the codes have all been cited as technical issues that prevented the success of QR codes (Kutsishin, 2012, para. 2–4). However, none of the studies has analysed how and why QR codes were implemented by museums in the first place. I suggest that attributing the failure of QR codes to technical issues misses other factors that need to be addressed. In particular, despite opportunities for synergy between pedagogy, technology, and new museology, QR codes often ended up being implemented for reasons that were separate from or contrary to educational goals, as will be discussed. The issues that caused this misalignment need to be identified and mitigated, otherwise new technologies – no matter how technically sound – could suffer similar lacklustre responses from visitors who feel unengaged, unchallenged, and uninspired by the content delivered.

ASSESSMENT FRAMEWORK

To assess what would make a QR code system a successful educational technology in a museum, it is important to identify a framework for success. What should educational technology look like in museums? Of course, it should work well technically. But, it should also work to fill an educational purpose. Research from the Aixell Institute, highlighted in the graph below, demonstrates how museums currently position educational opportunities as the foremost priority in their digital strategies for audience engagement.

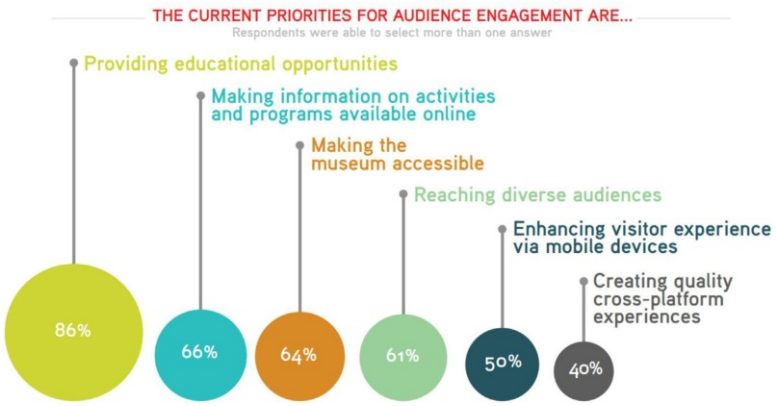

Figure 1. Aixell infographic (Aixell, 2015)

To meet this demand, a successful educational technology should address the goals shared by educators and practitioners in both formal and informal learning environments. A review of literature on adult education and museum learning reveals the following four goals that can constitute a framework for assessing educational technologies.

EXPERIENCE-DRIVEN LEARNING

Museum adult educators and professionals agree that allowing learners to contribute knowledge from their own experience enriches the learning experience for the individual and for the group. This is particularly important for adult learners, who benefit from customising their learning experience to fit with their life experience (Criu & Ceobanu, 2013). Many distance education programmes, Cahill (2014) suggests, have combined life experiences, problem-centred curriculum, and cultural knowledge in a way that specifically caters to adults' learning needs, since "adults learn differently than (sic) youth" (p. 318). Experience-driven learning allows learners to have greater control over their learning environment. It also requires creating a learning infrastructure that accommodates multiple and diverse learning styles, provides varied opportunities for expression and knowledge demonstration, or uses multiple means and media to tap into diverse learners' interests. Museums have also recognised the importance of including diverse and even dissonant viewpoints within their walls, and practitioners are working to ensure that the museum experience is physically, culturally, and socially inclusive, "connecting people across…race, age, economic background, and culture" (Simon, 2015, para. 10). New technologies can enable learners to connect diverse opinions across fields, disciplines, and create an environment where "learners construct their own personal learning environments" based on their interest, experiences, and networks (Bates, 2015, p. 58).

MOTIVATED LEARNING

Building on the above, scholars of adult learning agree that, especially in informal learning environments, adults need to be motivated to learn. They want to know the 'why' behind the 'what' they are learning, and are particularly concerned with applying knowledge to the real world (Longenecker & Abernathy, 2013). In formal educational environments this can be achieved partly through clear and well-developed outcomes and goals that enable adult learners to determine the exact skills or credentials they will develop in a course. Museums, on the other hand, must motivate visitors to learn in an informal and non-structured environment. Research by Falk (2012) has demonstrated the wide variety of potential motivations for visiting a museum, and innovative institutions are working to cater the experience to suit these different types of visitors. In some cases, exhibits and programmes are being developed specifically to cater to the community's needs and interests, working with the community to "facilitate timely dialogue and deep reflection about important issues" because, Matelic (2011) argues, people are motivated "to learn about people…their own lives, and the lives of their families, friends, neighbours, and business associates" (p. 142). Other institutions are working to motivate visitors by reducing barriers to admission, and this may range from designing for universal access to business models built on free admission (O'Hare, 2015). In some places, museums have partnered with schools and other learning institutions to offer alternative venues for study as well as credited courses or programmes (Washor, 2014). In each of these approaches, museums seek to motivate their visitors and communities to actively take part in the learning experiences offered inside and outside of the galleries; a successful technology should support this need to get adults excited about and motivated to learn.

ACTIVE LEARNING

Another key tenet in the literature is that adult learners need to shift from consumers to creators. This has resulted in a push toward active and problem-based learning that is especially important for adult learners, who generally learn best by doing (Longenecker & Abernathy, 2013). Active-learning scholars agree that the lecture is not always the most effective in promoting deep and lasting learning, and suggest that involving learners in the creation of knowledge is central to encouraging better engagement and retention. Literature shows that museums have long agreed that this shift toward participative experiences, dialogue, and shared creation is of crucial importance (Skramstad, 1999). By engaging visitors in the creation and production process, museums can create a 'bottom-up' approach that allows visitors to share authority with curators and professionals (Harrison, 2010). Active learning can also facilitate a more intimate, meaningful, and sustainable level of engagement. Successful educational technologies in museums support this engaged, active learning process.

CONNECTED LEARNING

Finally, there is agreement in the literature that it is imperative to foster the creation of learning networks. Because adult learning is an informal and ongoing process, it will not simply stop when a professional development activity ends. Instead, adult learners use networks to learn new skills, develop new competencies, and find answers (Gom, 2009). Museum professionals and educators want adult visitors to leave the museum with a sense of connection; visitors should leave equipped with the resources to learn more about a topic, to communicate with museum staff, and to connect with other visitors who share the same interests (Simon, 2015). But museum professionals themselves need networks of support, information, and resources. Partnerships between museums, community groups, and non-profits suffering similar financial constraints can enable professionals to share resources and data. New technologies offer a variety of opportunities for connected learning and data sharing, both between museum visitors and museum professionals.

EXAMPLES OF SUCCESS

Despite the technical issues inherent in QR codes, case examples demonstrate that some QR installations had the ability to foster the learning goals described above. Whether or not the codes were technically efficient after installation is of secondary importance in this case, as my chief concern is the *intended* use of QR codes. The following case examples combine experience-driven, motivated, active, and connected learning in new and innovative ways, demonstrating that QR codes have been purposefully implemented and intended as educational technologies.

An exemplar QR code system is the QRator programme at the Grant Museum of Zoology, University College London. With QRator, "you become the curator: add your own interpretations to museum objects; share your stories; find out what people really think about museum objects; and join the conversation" (QRator, 2011, para. 1). QR codes and iPad installations allow visitors to interact with other past, present, and future visitors in response to a provocation from the museum, including questions like "Do you think people today should perform dissection as part of their learning?" and "Is ecotourism an answer to local environmental and biodiversity conservation?" (QRator, 2011, "Current Questions"). When visitors add a comment via the QR code app, their comment is automatically added to the live forum thread in response to other contribution (Gray et al., 2012). In this way, the project not only creates a flexible and asynchronous learning network where visitors can contribute during and after their visit, it also shifts visitors from consumers to meaning makers and creates a network of diverse opinions. This kind of network where "knowledge is constantly shifting and changing" and "is not controlled or created by any formal organization" is fundamental to connectivism, a new approach to understanding learning that highlights the importance of informal networks of knowledge creation (Bates, 2015). Guided by the mandate to "create new models for public engagement,

personal meaning-making and the construction of narrative" (Gray et al., 2012, para. 1), the QR platform was recognized in 2012 with a Museums and Heritage Award for Excellence in the Innovation Category (QRator, 2011).

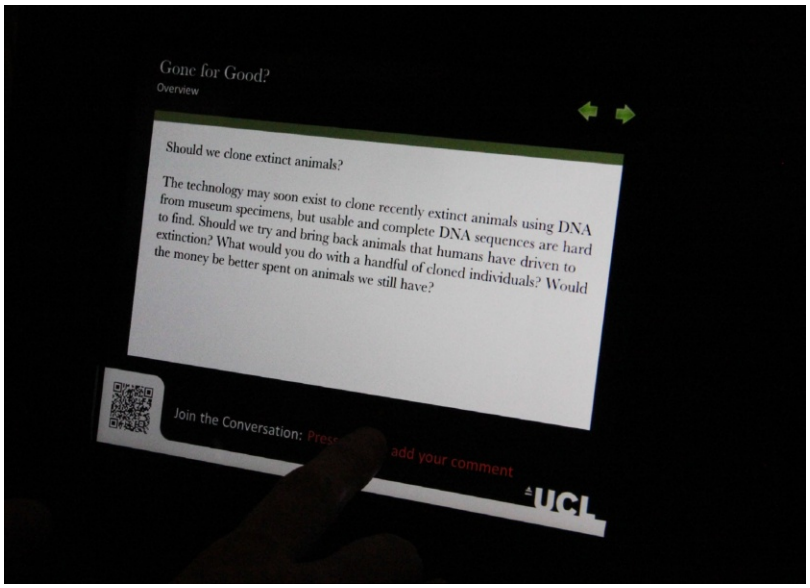

Figure 2. iPad installation at the Grant Museum

Monmouth, Wales demonstrates a different use of QR codes by taking them outside of the museum and into the community's living heritage. In partnership with Wikipedia and QRpedia, the town has implemented a network of QR codes on buildings, sites, museum exhibits, and even library books (Monmouthpedia, 2012). The codes provide a self-guided, multi-language tour to visitors of Monmouth, facilitated in part by the town-wide free Wi-Fi network. Perhaps more important is the collective process involved in the creation of these codes. Taking advantage of the wiki platform, Monmouth residents jointly create content. Residents are invited to contribute to the wiki, donate photographs and references, translate articles, and teach other residents how to use the wiki. With over a thousand new images donated to the project's commons, five hundred and fifty articles in twenty-nine languages, and approximately four hundred thousand page views per year, the project creates a significant buzz for the town (Monmouthpedia, 2012). Monmouthpedia empowers the community to become content creators, while at the same adding diverse experiences to its collective history and motivating residents to learn more about their town. While locals are motivated to continue learning about their town and sharing their own experiences, they are also connected to other locals and to new visitors through the process of active learning that is ongoing in Monmouth.

Figures 3, 4. Monmouthpedia plaques (Monmouthshire County Council, 2012)

THE REALITIES OF IMPLEMENTATION

The above case examples demonstrate that QR codes have been implemented as learning tools. However, despite these examples of QR code installations that purposefully create opportunities for experience-driven, motivated, and connected learning, it was surprising to find that in museums across Canada, enhancing learning was low on their list of priorities when they considered or implemented QR codes. The museums I surveyed ranged from large institutions to small and community-based organisations, which provided a range of experiences. These institutions were asked to express why they selected QR codes for their museum, what the main goals behind their QR code program were, what they felt this technology could contribute to exhibits, how the technology was being analyzed or measured, and what the intended future of the QR programme was. The following factors were commonly expressed as motivators for the inclusion of QR codes in an exhibit or gallery.

APPEARANCES

Survey respondents frequently noted that QR codes were included in their galleries to create a 'wow-factor' for visitors. Institutions hoped that QR code systems would help attract non-traditional museum visitors, specifically the tech-savvy crowd and young adults: "people who are super-keen about their phones." This finding is consistent with Schultz's (2013) study of museum QR codes, which concluded that QR codes were primarily implemented to appeal to "younger tech-minded people" (p. 212). However, even at the time of the survey most institutions recognised that this approach was largely not successful. For example, in instances where mobile technology could have generated excitement, misconceptions about proper museum etiquette often prevented this. One interviewee noted, for example, that while the museum's QR codes appealed to approximately 6% of the museum's visitors, most visitors expected a more traditional experience, and visitors were "still happy to have their rich experience in the museum without using their phone." The Museum of Inuit Art (not surveyed) experienced discrepancy between

their target audience – "tech savvy" young adults – and actual users of their QR code program – middle age visitors – and quickly developed a training programme to help these visitors unfamiliar with the technology (Procida & Mausser, 2012). For most visitors, the intended 'wow-factor' did not seem to occur; this could be, one study suggests, because by the time mobile technologies were implemented in museums, they were commonplace enough that visitors were not intrigued or excited (Holdgaard & Simonsen, 2011).

ANALYTICS

Most survey respondents did not see gathering visitor data as a primary goal, but mentioned it as a secondary benefit. Codes connected to programs like Google Analytics enable museum staff to gain real-time information about their visitors. This information can include which codes are most viewed, how long information is viewed for, and what browsing system and mobile type visitors are using to view content (Gray et al., 2012). This real-time data can help museums develop a more comprehensive idea of how visitors move through the galleries. It is also important for museums seeking to demonstrate engagement statistics to funding bodies frequently seeking visitor data as part of applications or final reports. However, this statistical data does not answer the more complex question of what motivated visitors to visit the museum in the first place. Analytics from QR codes, though perhaps useful at a surface level, cannot help museums understand and cater to these complex and changing motivations. Demographic data collected to aid or satisfy a grant requirement also does not necessarily require any pedagogical innovation or rigour, as funding bodies may not mandate any learning objectives or goals.

INCREASED DISPLAY SPACE

The most common survey response from institutions was that QR codes were developed as a response to a shortage of display space. Pressed for exhibit space, institutions looked to QR codes as a way to provide more information than printed display panels could physically and aesthetically contain. As space-savers, QR codes provide an ideal solution in that they might take up approximately a square inch of wall space, but can potentially hold infinite amounts of information online. In fact, in 2012 the Canadian Heritage Information Network (CHIN) specifically suggested QR codes as a way to "provide visitors with additional information" (CHIN, 2012, para. 2). Survey respondents suggested that QR codes benefitted visitors seeking to learn more about a particular topic where in-depth information "would otherwise take too much room on display boards." However, providing more information was not necessarily linked to an innovative learning experience for visitors, but an extension of the same learning experience already available on text panels. Even if the supplemental information is interesting, this approach

does not incorporate the content creation, dialogue, and connection that, as outlined above, would typify a successful learning technology.

THE DISCONNECTS BETWEEN TECHNOLOGY AND PEDAGOGY

Survey results demonstrate that even if QR codes had been technically reliable, in many institutions across Canada they were not implemented to enhance learning. Why not? I suggest that there were several key obstacles that prevented this technology from being linked to innovative pedagogy, even before technical issues became a concern. As museums work to create digital strategies and implement educational technologies in the future, the following obstacles need to be addressed.

Firstly, organisational structures proved to be a challenge. These challenges existed primarily because the departments responsible for implementing QR codes – often marketing, design, or IT departments – were typically not involved in education. None of these departments necessarily lack the expertise to design a system around specifically educational goals. Nevertheless, museum scholars Holdgaard and Simonsen (2011) argue that in Denmark, conflating communicating with visitors and marketing has led some museums to "commodify and instrumentalise communication as a delimited object directed towards an audience (museum visitors as consumers)" (p. 109). In some larger institutions this problem is beginning to be mitigated by the creation of new positions specifically tasked with digital media (e.g. Royston & Delafond, 2014). Departments devoted specifically to understanding how technologies can support their institution's strategic and pedagogic goals will help ensure that digital technologies are integrated throughout the institution. In smaller institutions where this position creation may not be possible, the establishment of interdepartmental task forces or partnerships with consultants, scholars, or students from appropriate disciplines could help to ensure that technologies are being thoughtfully and strategically integrated and maintained.

Another obstacle was a suspicion and criticism of technologies and their role in learning in museums. For example, Earle (2013) argued that "the drive to 'engage' patrons with gadgets strips museums of their innate wonder" (para. 1), while Griffiths (1999) warned that many museum practitioners and visitors alike feel there is a problematic "blurring the line between the traditional public museum and the commercial theme park and retail complex" (para. 3). These are of course, valid critiques. In some cases, museum staff and volunteer educators were apprehensive about the value of the technology and therefore did not recommend it to visitors. Survey responses demonstrate that this apprehension was not unique among museum staff, as many visitors, including parents and teachers, often did not recognize that the QR codes could be an educational asset rather than a distraction. In other cases, another study shows, visitors were uninformed about what the QR codes might hold, and usually expected them to be transmitters of "more detailed info if you want it." Clearly, conceptions of how mobile technologies can supplement and enhance

learning need to change before mobile programs can successfully be part of a wide educational strategy in museums.

Conversely, some museums installed QR codes enthusiastically but without a comprehensive plan or learning strategy. As Schultz (2013) argues, in many cases museums jumped into QR codes without a formal needs assessment or strategic direction:

> A successful project involves identifying its purpose and goals in response to a particular need; however, often, due to a lack of resources or enthusiasm to "get started," the needs assessment step in the project's lifecycle is omitted or is informally based on assumptions and experience. The problem in this case is that wasted time and effort can result if the new technology implementation does not serve a need. (p. 5)

Implementing technology for technology's sake may allow museums to appear innovative, but does not encourage a departure from the traditional curatorial voice that has typified museum learning for many years. Although the medium may have changed, the pedagogical approach has not, and providing "additional information" can continue a passive rather than an active learning experience. Codes that supplement displays with links to primary sources help add information, but do not help visitors develop the complex skills required to effectively decode primary sources (Lindquist & Long, 2011). This debate mirrors the debate about video lectures in online education, where educators argue they merely replicate "the traditional and familiar pedagogical model of a university classroom," despite the fact that lectures have proven "ineffective at promoting critical thinking, fostering deep understanding, and supporting the application of knowledge" (McConachie & Schmidt, 2015, para. 6). By digitising old methods, museums run the risk of being pedagogically antiquated despite appearing innovative.

Finally, museums have a variety of other goals, expectations, and priorities beyond education. This is partly because not all visitors come to the museum specifically to learn, as Falk (2012) has demonstrated. Visitors' diverse needs mean that museums cannot always prioritise learning, especially if they want to cater to a variety of visitors. The other reality is that museums are not judged or evaluated on their educational results, at least not directly. Museums are often evaluated by visitor numbers and their bottom line by funding agencies, and are judged by visitors on a wide range of components ranging from parking to customer service, and from physical comfort to cafeteria food. In this complex web, education is only one priority for museums. As such, it is understandable that QR codes were often not implemented as educational technologies but in an effort to increase visitor numbers and enhance the visitor experience. Very often, we hear about enhancing 'experience' and 'engagement,' but it is often unclear to what extent education is a factor in this; finding ways to recognise the overlap between education and experience will thus need to be a priority if museums are going to effectively implement educational technologies in the future.

MOVING FORWARD

It is difficult to determine if QR codes might have been more widely and purposefully implemented had they not been plagued by technical problems ranging from variances in apps to connectivity issues. Would museum professionals have found new ways to innovate with the codes if more visitors had used them? This seems likely. But, would more visitors have used the codes if they were innovative, stimulating, and rewarding in the first place? Either way, if museums want to provide technology-enhanced learning experiences for their visitors, they need to carefully consider the obstacles that prevented QR codes from even being understood as educational. Continuing to debate whether or not technology can support learning is no longer productive; not only is technology-integrated learning commonly accepted in formal learning environments, there is no question that we are in the midst of a radical shift in how visitors experience museums. Museum websites receive far more visits than museums themselves, and even during their visit "74% of guests are still drawn into their little handheld screens" (Museum Hack, 2015, para. 1). The question is no longer whether visitors will use their mobile devices to experience and learn about culture, but instead how museums can harness the power of these devices?

Perhaps the most important lesson that we can learn from the rise and fall of QR codes in museums is that in order for a new technology to be pedagogically innovative and challenging, educational goals need to be built into the design and development process right from the beginning. Museums do not need to invent new approaches and systems to solve this issue, but instead can look beyond their own institutions and borrow from industries that have already had success with educational technologies. For example, the Imperial War Museums network in the UK has recently found success working with an AGILE project management framework; other frameworks borrowed from systems development and instructional design, including ADDIE and ASSURE, may allow museums to ensure that a process of strategic analysis, selection, and evaluation produces technologies that meet multiple goals (Royston & Delafond, 2014). Museums also have example frameworks to draw from within their own sector, including the *Digital Engagement Framework* developed by Visser and Richardson (2013). Whatever framework museums choose to approach new technologies, it is important that the strategic goals, audience, multi-disciplinary project team, learning outcomes, and evaluation strategies are identified first, and that the technology is selected next and in collaboration. By implementing technology first, Koven Smith concludes, we miss the need for fundamental change:

> We thought that our visitors were asking for technology, but what they really wanted was a different way of interacting with the museum altogether …we're not innovating in the way we need to be to survive. Instead, we're just making a bunch of flashy junk. (para. 5)

Museums have a unique opportunity to be leaders in the field of technology-supported adult education. They are well positioned to be labs where innovative

professionals can fuse creative pedagogy and new technologies. Taking the lead in developing, testing, and connecting mobile learning technologies is a niche that museums are uniquely equipped to fill. If museums want to be an educational resource for learners of any age, the technologies they employ need to be integrated into this mission, not separated from it.

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