**The Rocotopuses Garden**

**Introduction**

In the revered halls of Beverage Bits, a principled art gallery hosted in the historic heart of St Andrews, there lies a canvas awaiting a transformative artist's stroke. This institution, already equipped with an array of smart devices, such as lights, buttons, and motion sensors, stands at the cusp of a renaissance – locally, globally, and beyond. The proposition aims to serve as a blueprint for the technological enhancement of the art gallery space. Principally, this proposal seeks to intertwine modern advances and the timeless pursuit of creative expression, enhancing the sensory tapestry of the viewer's experience. By exploring cutting-edge interactive technology solutions, we aim to transcend traditional boundaries.

The proposal aims to expand the current technology setups in museums, going beyond regular implementation, such as having audio explanations through a headset connected to a device like in St Andrews Castle (Historic Environment Scotland. n.d). This proposal outlines the steps and plans to integrate advanced interactive software and hardware systems into such institutions.

**Motivation**

As an independent interactive hardware and software designer and developer, my journey is fueled by a passion for the arts and the exploration of technology roles within cultural and educational sectors. Three fundamental motives drive my pursuits. Firstly, I aim to preserve and enhance cultural education in art galleries and museums. Secondly, I address the challenge of scarce and unrefined data in the industry, as identified by Candlin and Poulovassilis (2020), by empowering curators with accessible, user-friendly data tools. Lastly, my vision extends to creating novel revenue streams for museums, ensuring their vibrancy and sustainability in an ever-evolving world. These goals generate a singular vision: intertwining the elegance of the arts with the popularity of technology, thereby redefining the museum experience for the digital age.

**Brief Exploration of Current Trends**

Integrating technology is pivotal in redefining visitor experiences and operational sustainability in the evolving landscape of art galleries and museums. A significant trend shaping this landscape is the rise of online sales as a crucial business driver. As highlighted by Fernandes and Alonso (2020), the advent of the Internet has expanded customer bases and bolstered revenue streams, offering a lifeline to institutions often constrained by financial limitations.

Moreover, the global adoption of social media has opened new avenues for content sharing and engagement. According to Chatterjee and Kar (2020), this digital proliferation is enhancing the performance of small and medium-sized enterprises (SMEs), including art galleries, by leveraging the potential for broader reach and even virality.

In educational offerings, a notable shift is observable towards dual-purpose models that blend entertainment with learning. Leeuwen (2013) discusses this evolution within museums, aligning with broader educational trends where gamification is crucial. Kusuma et al. (2021) affirm that gamified education significantly boosts learning outcomes. Supporting this, Figure 1 in the appendix from Huang and Hui (2020) exemplifies the benefits of gamification through enhanced pre and post-test scores following such interventions.

These trends collectively paint a picture of an industry at the cusp of a technological renaissance, where digital tools not only supplement traditional art experiences but also open new horizons for engagement, education, and sustainability.

**Proposal**

This project had ambitious goals to create a supreme set of interactive technologies. Some key implementations are expressed here:

Key Implementations:

* Art Generator: Leveraging machine learning APIs like OpenAI, users can create custom artworks, offering a new product line and potential income.
* Paint Application: Enhances interactivity and reduces costs by digitising the art creation process.
* Computer Vision: Enables digital painting via computer vision, adding a tech dimension to art creation.
* Artist Narratives: Headsets will provide accessible artist commentary, enriching the visitor experience.
* Custom Language Model: A bespoke language model will offer on-demand, in-depth information about the exhibition.
* Interactive Quiz: An escape room-style quiz adds an engaging, educational challenge to protect the gallery's art.
* Virtual Reality: Explores additional artwork virtually when physical pieces are unavailable.
* Projector: Showcases a rotating selection of digital art and customer-created content.

**The Rocktopus**

The Rocktopus is the physical manifestation of the ideas, where the 3D print hosts the hardware systems. The systems inside, such as the brains (Raspberry Pi & Arduino), eyes (Projector & Webcam), ears (Webcam) and mouth (Speaker), could create a unique experience for the gallery goers.

Drawing from Jencks (2010) and Stone and Spiegel (1992), the Rocktopus, pictured in Figure 2 of the appendix, is a post-modern nexus where nature moulds with technology, challenging grand narratives by its very form. This hybrid creature questions conventional classifications. Its tentacles represent the diverse, complex networks of global culture. As the centrepiece, the Rocktopus anchors the gallery's interactive journey, blurring the lines between the virtual and physical and inviting active participation. This encouragement deconstructs traditional gallery experiences. The Rocktopus's dual form, biological and technological, prompts visitors to ponder their merged identities within a digital age. It assumes multiple roles—quiz master, conversational interface, projector, and guide—embodying a multifunctional pastiche. In essence, the Rocktopus is a conduit for an immersive, interactive narrative, redefining art, engagement, and the influence of technology.

**A Proposed Customer Flow (Storyboard in the appendix)**

You are a family of four going to a post-modern art exhibit. You are given a set of air pods to listen to the artists explain their art when you press a button on your phone or in the gallery and have been told there is an optional interactive game at the end of the exhibit. You are enjoying yourself and interacting with some interesting art pieces.

Eventually, you come to the end of the exhibit, and suddenly you trigger a motion sensor which allows you to enter the art exhibit's interactive escape room-style game.

The quiz will have multiple interactive software and hardware elements. Primarily, the lights will be used to display correct and wrong answers. There will also be the option to get clues on the OLED displays and even the ability to listen to the artists' explanations of the art piece in question. After passing the quiz, users will be prompted to curate their artwork by describing the piece to be generated, painting it using the mouse or using just their hand.

**Actualisation**

We have used a 3d Printer, an Arduino Uno, a Raspberry Pi, a Canyon Web Camera, an HP monitor, and a keyboard and mouse setup to curate this vision. Our current realisation of this vision is limited, though it includes a digital interface to view and listen to explanations of the artwork with an interactive quiz following. The 'Escape Room' style quiz interacts with the current Internet of Things as correct answers turn the intelligent lights green (which the children will particularly love). If you need a hint, the OLED displays will assist.

Further implementations include software interfaces for art generation, both manually and automatically. The first is a basic paint application that allows users to create an art piece manually using the mouse. The second is an automatic art generator, and the third utilises computer vision to draw on paint. Finally, to interact with the Internet of Things setup beverage bits already have, we built a web server where users can view the installations and perform a quiz.

**Challenges:**

During implementation, the main issues were:

* Database Connectivity: Recurrent issues occurred with database connections due to incorrect token usage.
* Raspberry Pi Performance: The unresponsiveness of the Raspberry Pi hindered development and suggested it may not be suitable for running the system.
* Device Communication: Establishing a reliable connection between the Arduino, Raspberry Pi, and the web server was complex, compounded by Raspberry Pi's performance issues.
* Input Detection: Anomalies with breadboard buttons led to uncertainty in detecting inputs and IoT state changes in the database.
* Web Camera Sensitivity: Managing the sensitivity of the web camera proved challenging, affecting the ability to draw using the camera and hand motions precisely.
* Integration: Due to the complexity and multiplicity of the design, coordination between elements often became a limiting factor.

**Conclusions**

To conclude, this implementation is the beginning of the potential of this design. To further our concept, we would need a more extensive Rocktopus 3D printed to place the hardware systems such as the brains (Raspberry Pi & Arduino), eyes (Projector & Webcam), ears (Webcam) and mouth (Speaker) to create a unique experience for the gallery goers. The limitations of the implementation against the proposal are apparent. However, the current design goes a long way towards manifesting a more interactive exhibit with unprecedented features beyond the implementations currently witnessed in the industry.

I feel my design would be the pinnacle of achievement within the interactive software and hardware space, especially due to the artistic touch. As such, I was bound to fall short from the start –, but I am glad I explored this space. The piece is a design fit for current debates, and while boasting the potential of technology, the design also serves as a warning of the associated dangers. While a limiting factor concerning this coursework, it may be a sensible idea not to take the scope of this idea beyond the limiting factors of the hardware I have used throughout.

**References**

Candlin, F. and Poulovassilis, A., 2020. Understanding and managing patchy data in the UK museum sector. *Museum Management and Curatorship*, *35*(4), pp.446-459.

Chatterjee, S. and Kar, A.K., 2020. Why do small and medium enterprises use social media marketing and what is the impact: Empirical insights from India. *International Journal of Information Management*, *53*, p.102103.

Fernandes, A. and U. Afonso, L., 2020. Online sales and business model innovation in art markets: A case study. Social Sciences, 9(2), p.7.

Jencks, C., 2010. What then is post-modernism?. The post-modern reader, pp.14-37.

Historic Environment Scotland. (n.d.). St Andrews Castle: Overview. Available at: https://www.historicenvironment.scot/visit-a-place/places/st-andrews-castle/overview/ [Accessed date: 16 December 2023].

Kusuma, G.P., Wigati, E.K., Utomo, Y. and Suryapranata, L.K.P., 2018. Analysis of gamification models in education using MDA framework. Procedia Computer Science, 135, pp.385-392.

OpenAI. (2023) *Image generated by DALL-E system*

Stone, L. and Spiegel, G.M., 1992. History and post-modernism. Past & Present, (135), pp.189-208.

Van Leeuwen, T., 2013. The representation of social actors. In Texts and practices (pp. 41-79). Routledge.

Appendix:

A graph of a number of people with blue and orange bars

Description automatically generated

Figure 1. Learning outcomes pre to post gamification - Huang and Hui (2020)

A plastic head with a metal face and a chain around it

Description automatically generated

**Figure 2 – The Terminator Rocktopus (Kuleshow 2023)**

A group of people standing in front of a reception desk

Description automatically generatedA group of people looking at art

Description automatically generatedA group of people looking at a device

Description automatically generatedA person and person standing in front of a large octopus

Description automatically generated

A group of people standing in front of a quiz show

Description automatically generatedA group of people painting

Description automatically generated

**Storyboard flow of the customers journey – figure 3. (OpenAi 2023)**