



TAKING OBJECT-BASED MEDIA FROM THE RESEARCH ENVIRONMENT INTO MAINSTREAM PRODUCTION

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ABSTRACT

In our IBC2017 paper [1] we described our experiences with Object-Based Media (OBM) and outlined our aims for developing a toolkit to enable authors to make such experiences quickly and easily. Here, we describe the progress we have made developing this toolkit. We show how its development was shaped by collaborations with producers: first, how the data model and player were shaped by working with the BBC Arts programme *MAKE! Craft Britain* and second, how the tools and player were trialled at a workshop during the 2018 Encounters Film Festival in Bristol. We then describe the impact of two long-form productions on the tools. A commission designed to create a responsive media experience for a younger audience and an episode of the BBC's technology magazine programme *Click*, who approached us to make an interactive edition of their programme. In addition to presenting the current state of the toolkit, this paper considers decisions made during the toolkit's development, in terms of its design and architecture, how it integrates with other systems, and how we engaged with users, including experienced production teams. We reflect on how these decisions are helping with our long-term goals of discovering where OBM can bring out new forms of audience experiences.

INTRODUCTION

In our IBC2017 paper we described our work in creating our *Cook-Along Kitchen Experience (CAKE)* as an example of Object-Based Media and our plans for building tools for OBM workflows [1]. Our aim was to take the production of interactive and responsive content from one-off exercises towards being business-as-usual and this can only happen if the tools are *visible* and *accessible* (and usable) to potential users, *flexible* in the way they can be used, and if the experiences they create have *impact* with the audiences. Our hypothesis was that we needed to create tools which did not require coding skills and needed minimal training so that they could be used directly by artists and producers as they are the people who have the potential to develop these new forms of media. Over the past two years there has been a long and often difficult process of turning the initial concepts and data model into viable cloud-based tools that can be accessed via a web browser and integrate with the BBC's business systems [2]. In achieving these aims the tools can now be used by anyone with a system login.



OBJECT-BASED MEDIA – THE MAIN STRUCTURAL OPTIONS

Our previous work on a number of one-off examples of Object-Based Media have led to us identifying a number of advantages to be derived from this form and the different ways in which the user and content can interact.

Structurally there are two ways in which an OBM experience can vary, by changing the narrative pathway and by changing the presentational form. The first we have also termed *responsive narratives* and can give different routes through a subject or story and the second we've termed *responsive presentations* which can provide similar information but in different forms such as a cooking tutorial can be conveyed either with video, or via illustrated recipe cards. This approach can also be used to distribute content across several devices as exemplified by the 2-IMMERSE project's MotoGP service prototype [3].

There are also two different ways in which the experience can interact with the user, *explicitly* through dialogue boxes, remote controls or other control devices, and *implicitly* through data provided by the user's device or via a login. The two can be combined so for example, a locative experience may have explicit user interaction whilst responding implicitly to the user's movements.

Finally, in terms of user interaction there are again two distinct ways of interacting with the audience. The first is *lean-forward*, in which there is ongoing interaction, possibly even a dialogue, between the content and the audience. The second is *lean-back*, in which any interaction takes place before the content is played out and the resulting experience, although potentially different for each audience member, is consumed in the same way as traditional linear media. In practice most experiences combine the two.

One of the key problems we have faced is that many people simply equate OBM with branching narrative, which has disadvantages in terms of production costs and creating a feeling of missing out¹ [4]. The release of *Bandersnatch* has further raised the profile of branching narrative but there are many other structures used in choice-based games or stories [5,6,7]. So we have drawn on our experience with previous prototypes to create four *Value Propositions* to help guide workshop participants and production teams. These propositions are: *Variable Depth and Duration*, which is about experiences that vary in detail or length based on the viewer's level of knowledge or time available; *Media Switching*, which varies the media used to tell stories; *Made for Me*, which personalises content around preference (maybe you're squeamish) and *Take Control*, which empowers the audience to engage, interact and *lean-forward* to affect how an experience plays out. It can also be used to enable a dialogue with the viewer.

One further principle which is emerging from our work is that the interaction between audience and content should serve the subject matter. Interaction can interrupt the viewer's flow and immersion, but if used well it can draw the audience further into the experience, as with many video games.

¹ Branching narrative can offer a satisfying experience where the choices are a key part of the narrative, such as exploring future scenarios in a non-fiction context.

THE SET OF TOOLS - *STORYKIT*

StoryKit aims to make the creation of responsive, interactive and adaptive stories easy, repeatable, and scalable. It has been designed to allow these stories to be created and published without the need for software development effort. Central to the tools is our data model for stories where each node in a graph represents a narrative element and this element can be represented by a number of different forms of media [1]. The way the experience moves onto the next item can be controlled using variables which can be both pre-set at the start of the experience and can be changed as a result of user interaction.

StoryKit currently consists of a tool for authoring these stories, *StoryFormer*, a player for rendering them, *StoryPlayer* and an *Upload Ingestor* to upload and manage media for use in *StoryFormer*. These tools have been designed to be cloud-based with web front ends for writing to, and reading from the database on the cloud platform. *StoryPlayer* also includes analytics to record how audience members interact with the content.

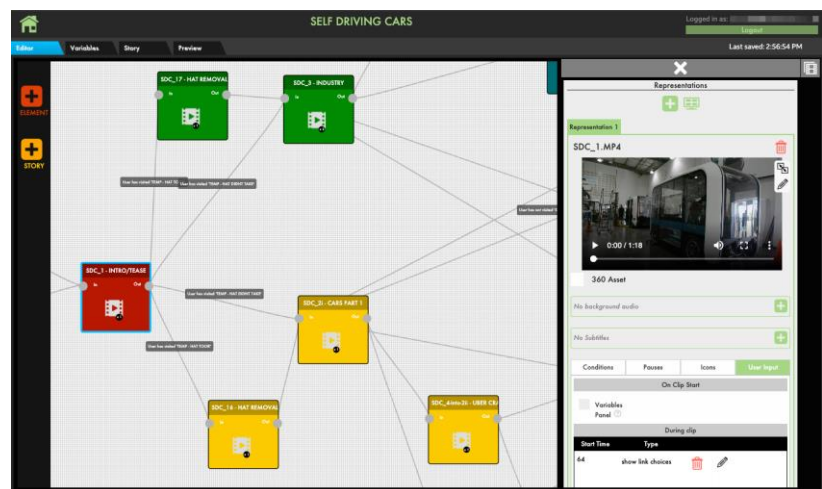


Figure 1 – The *StoryFormer* interface.

The development of this as a cloud-based system for multiple users necessitated the inclusion of security and authentication systems. Whilst this has involved a great deal of extra effort, at the same time it has enabled ease of access to the tools and the ability to manage permissions around access to these tools and the content. To achieve this, we chose to integrate with existing BBC systems, making use of their sophistication and reach, to enable anyone with a BBC login to be given access to *StoryKit*². We have also utilised existing BBC systems for serving up the media assets to the player which gives the additional advantage of giving *StoryPlayer* inbuilt scalability.

In order to create a responsive story, users can request access to the tools. Once they are whitelisted on the system they can immediately access and use *StoryFormer* in their web browser. They can then experiment with structures and interactivity for their responsive stories, upload media assets and preview the results as they go. *StoryFormer* has been developed with no dependencies on existing tools or workflows so users can utilise their familiar media editing tools to create their media assets. This means that the cost of deploying the tools to a production team are small and the costs of making the media experiences are comparable to that of conventional production so existing brands can create responsive experiences to sit alongside their television or radio programmes.

Publication of media is via an automatic process using BBC systems which is currently being refined, whilst the experience metadata is published to content delivery networks.

² BBC logins can be given to third parties further extending the reach of the tool.

COLLABORATIONS AND COMMISSIONS

The development of *StoryKit* has been greatly assisted by working with content creators and producers. We have run events where we have invited participants to test out the tools, commissioned a production and have also been approached by BBC programme teams interested in working with us.

Make-along: Origami Jumping Frog

Whilst the publication of *CAKE* on BBC Taster attracted around 48,000 unique browser visits, its lasting value for us has been in bringing the idea of Object-Based Media to the production community. In October 2017, several months into the development of the toolkit, we were approached by Stephen James-Yeoman from BBC Arts who had seen *CAKE* and wanted our help to create an interactive paper folding make-along to tie in with a television season on crafts he was planning. Working with real content, tied in to a television series, was an exciting prospect. It gave us a tangible goal with a deadline attached, allowing us to focus and fast-track the components that were important for an audience and producers. We made the decision to pause development on our authoring tool in favour of developing the data model and *StoryPlayer*.

We worked with RDF, the production company making the series of *MAKE! Craft Britain* for BBC Four. They wanted to use the feature of dynamic pacing from *CAKE* which allowed the viewer to control the speed of the experience. The filming was with 3 cameras, the main presenter view, a close up of his hands and an overhead shot. The video was segmented into separate folds and each of these was presented with the option of 3 viewing angles along with a static diagram of the fold. Because the production tool was still a work in progress, all the underlying JSON data structures to drive the experience were authored manually. Development of *StoryPlayer* finished in time for the launch in March 2018 on BBC Taster. *StoryPlayer* supported both desktops and multiple tablet versions and included the ability to record analytics so we could understand how people used it.

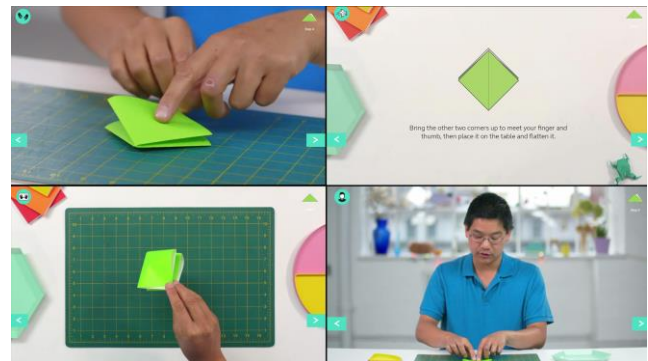


Figure 2 – The four viewing options.

Outcomes

We learnt a great deal from working with the production team, from sharing and translating ideas to aligning with production timelines. One of the most interesting things we found was how open the teams have been, from capturing metadata about their processes to extolling the benefits of OBM to colleagues and producers. The team also promoted the experience on social media, resulting in around 38,000 unique browser visits in the first 6 months, with more than 8,000 seeing it through to the end. This provided a rich set of analytical data and feedback from the audience about how they found having more control valuable. This collaboration gave further visibility to the work, accelerated the development of *StoryPlayer* the player and gained valuable insights into production processes.

Bristol Encounters Film Festival Workshop

After the experience of working with BBC Arts, the focus of the work returned to the development of the authoring tool. By September 2018 *StoryFormer* was in a form that was suitable for trialling, and we took the opportunity to run a workshop with an invited group of content creators over two days at the Encounters Film Festival in Bristol. The aims of the workshop were: firstly, to get feedback on the authoring tool; secondly, to identify how other people might use OBM, what they see as its advantages and what challenges they anticipate when using it, and thirdly, to further the development of a community of practice around OBM. The workshop was structured primarily around teams of participants using *StoryFormer* to build experiences. The content creation process was preceded by an introduction to OBM and ideation activities and followed by demonstrations and feedback sessions.

The workshop resulted in the production of five responsive stories, all conceived and produced in just 8 hours. These took the form of a variable depth film trailer, a variable length news article, an interactive crime drama, and a tour guide of Bristol with different narrators for children and adults and one team even used *StoryFormer* to mock up a smartphone app, using mostly images and audio, which reflected the flexibility of our toolkit.



Figure 3 – The workshop underway.

Outcomes

The combination of the backgrounds of the participants (a range of academics, artists and storytellers from outside the traditional broadcast media world) and the use of our *Value Propositions* in the workshop introduction was successful in mitigating the apparently natural tendency to build branching narratives, resulting in a varied set of stories. Many improvements to *StoryFormer* were suggested, although it was generally found to be intuitive and easy to use. OBM was seen as an exciting way of increasing audience impact, and concerns were mainly centred around the potential to be distracted away from the core challenge of storytelling by the novel capabilities of this approach. The fact that all five teams were able to create working, interactive stories in the time available gave us sufficient confidence in the usability of the tools to press ahead with more ambitious projects. Indeed, one of the teams planned out their experience on paper and captured the media and only compiled the experience in StoryKit in the final hour.

The Commission - *Instagrammification*

In November 2018 we issued an invitation to tender to five independent media companies asking them to draw up an idea for a responsive documentary which would exploit the affordances of *StoryFormer* and appeal to a target audience aged between 16-34. In January London-based Spirit Media won the commission with a project called *Instagrammification*; framed as a responsive journey through “the good, the bad and the ugly of Instagram”. Once completed the project is scheduled to be published on the BBC’s Taster platform.

Spirit Media proposed a format of narrator-led journeys through journalistically themed chapters populated with Instagram examples. The experience begins with a *lean-forward* moment as users are quizzed about where they live, their interests and they are asked whether they are in the mood to be entertained or informed. After the initial choices, the user journey is largely *lean-back* and resembles a linear documentary, but one which is personalised with elements of variable depth and duration. User mood is also reflected by using two different presenters, one for those who had selected the *entertain* option, the other for the *inform* option. The benefit of this was it demonstrates how *StoryFormer* could handle two markedly distinct experiences of essentially the same overarching story. However, it also restricts the opportunities to reuse media assets across both tracks.

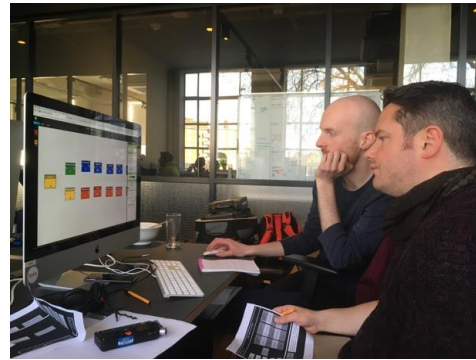


Figure 4 – Using *StoryFormer*.

Outcomes

Some issues arose in the workflow and use of the *StoryFormer* tool. Because this project was a one-off the team felt they could work more effectively with their tried and tested tools, so only one member of the Spirit Media team used *StoryFormer*, even at the planning stage. The rest of the team preferred to collaborate using their familiar combination of post-its, web docs, worksheets, and slides.

Early in the production the editor developed his own labelling system for identifying media assets and identifying them with narrative elements as they were uploaded to avoid loading media into the wrong narrative element. The producer reported that the advantage of planning responsiveness ahead of time was that the interviews were shaped around the clips needed to populate the *StoryFormer* graph. For example, the expert was asked to give a simple and then a more technical explanation to describe a 'bot'. Another observation from the team was that this type of content will need new types of planning and scripting tools. The editor reported the biggest challenge in creating a *lean-back* responsive experience was using music/audio across the narrative elements to create a sense of flow and mark emotional beats. The challenges reported by Spirit Media arise from both the early nature of the craft and the prototype nature of the tools and workflows. While the craft of creating object-based experiences is still in its infancy, the tools to produce content must remain flexible and need to develop in tandem with the craft.

BBC Technology Programme - *Click*

In September 2018, we were contacted by *Click*, a weekly BBC television programme covering news and developments in consumer technology, broadcast on the BBC News channel in the UK and globally on BBC World News TV. *Click* have a history of content innovation from 360 video and Virtual Reality to making shows entirely on mobile phones. Whilst covering the launch of *What is Love?* [8], an OBM experience developed by the University of York and BBC R&D, they had learned about *StoryKit*, and subsequently came to film an interview with us.

During the interview, we demonstrated *StoryFormer* to the production team, and explained how we thought an interactive, personalised episode of *Click* could be built with it. This led

to us meeting the wider team in October to discuss the possibility of an episode of *Click* built with *StoryFormer*. We invited the team to a workshop which helped familiarise them with *StoryFormer* and its capabilities. They were able to provide us with some immediate feedback regarding the workflow and user interface.

Outcomes

The early, ad-hoc testing made us realise that we were missing some basic functionality. As a result of *Click*'s initial feedback, we rebuilt *StoryFormer*'s media browser to make ingested media searchable and filterable by various fields and we improved our display of upload status and error reporting in *Upload Ingestor*. We also added media swapping functionality, enabling existing interactivity to be preserved when media is replaced.



Figure 5 – Demonstrating StoryFormer on *Click*.

At the same time as *Click* were developing potential interactive treatments for the show, matching responsive storytelling functionality with stories, we were able to help *Click* refine their treatment. As well as ensuring that the interactivity served the storytelling, we wanted the *Click* episode to excite and surprise the audience and showcase what OBM could offer. *Click*'s next step was to build a prototype introductory sequence and news segment in *StoryFormer*. From this it was clear that they would need more editorial control over *lean-forward* interactions with stories such as when they surfaced during a segment, whether the user could change their mind, and the ability to set a default path in case there was no response from the viewer.

It also became clear that certain types of interaction were greatly enhanced if it was the result of a call to action by the presenter. This brings in the interaction design as part of the filmed content and this reinforces the need for interaction design to be considered before the presentational elements of the footage are recorded. This design leads to experiences where the audience member is having a dialogue with the presenter and the content.

We had originally assumed that *StoryFormer* would be used to plan interactivity before any media was gathered, but some elements of the interaction design are not surfaced in the rendering of the story in *StoryFormer*. The *Click* production team used an online diagramming tool to create a representation of the interactivity to communicate the design with other production team members. *Click*'s enhanced interaction diagrams indicate a need for *StoryFormer* to render more of the interaction details in its graph display, as well as rendering non-functional production metadata used purely to annotate a story for communication purposes.

Click have now announced that the programme built with *StoryKit* is scheduled to go out as their 1000th episode and will be a full length interactive special, available on the bbc.co.uk/click website and a linear version will be broadcast on television [9].



DISCUSSION

Following the creation and testing of a number of prototypes of Object-Based Media, we believe that it can provide significant value to audiences. The goals of our project are twofold, to get the wider acceptance of OBM as business-as-usual, and to understand which aspects of it can bring the most value. To achieve these, we need to demonstrate a feasible ecosystem of tools and workflows for creating and publishing these experiences. We also need production teams and commissioners to be aware of the possibilities and to buy in to the concept. Understanding how OBM can bring value requires ongoing experimentation. We need the capability to build highly polished, high-profile examples, as well as low-fi experiments for playing with ideas. Creating these experiences is not, however, a task for R&D engineers, we need artists and storytellers to do this work. *StoryKit* is our answer to this challenge, designed to enable OBM experiences to be created without the need for software development skills.

The way that *StoryKit* was designed, with no dependencies on existing tools or workflows, has enabled production teams to bring their own ways of working to the tool and adapt them to fit the new media form. Whilst we originally envisaged *StoryFormer* playing a planning role, teams have been creative in the ways they have planned the experiences leading to insights about the types of information that could be usefully surfaced in the user interface. Whilst the new medium is in its early form the exploration of the problem space that is media production must allow for different ways of working and this needs to be enabled by the production tools. Tools which are easy to use and agnostic to workflows will help accelerate the exploration of the design space for new forms of storytelling.

We hope to extend the availability of these tools through the release of open source versions in the near future, thereby enabling innovation in these new media forms to extend out to academic and artistic communities and alternative media outlets. It could also enable further innovation in terms of new functionality contributed by developers.

REFLECTIONS ON THE NARRATIVE FORMS

The underlying message emerging from these experiences, in both long and short form, is that we are at the beginning of the emergence of a new medium enabled by tools which can be used by content creators. While the Origami Jumping Frog experience extended a linear tutorial format, adding enhanced navigation and alternative viewpoints, the agency it provides to the audience is most valuable in terms of pacing the content, the alternative viewpoints and the ability to repeat difficult sections. There is no alteration in terms of narrative; it was the same for all 3 video angles. By contrast the Encounters Workshop provided a series of reactions from the teams to the possibilities offered by the tools. The participants explored the potential of varying depth and duration along with alternative media presentation.

The two long-form examples have seen the emergence of new workflows and new approaches to storytelling. Both teams used additional tools at the planning stage, with a particular emphasis on communicating the ideas. This has enabled reflection and innovation to happen in advance of the writing and capture stage. In both cases this has changed the way the teams have structured the filming, including elements of interaction with the viewer. In the case of Spirit Media this has meant asking for multiple versions from interviewees for the different audiences but to the audience the experience will be



personalised so similar to a linear video form. In the case of *Click*, they are adapting their direct and informal presentational style towards the form of a simple dialogue between the audience and the presenters. At the time of writing both productions are still in development, so we have not experienced the results, but there are promising signs of the emergence of new media forms from the meeting of interaction and agency with audio-visual media, what Marshall McLuhan termed “hybrid energy” [10].

In this process of exploring the design space of interactive narrative we can see how different forms of existing narrative fit with the new possibilities that arise from interaction and agency. The contrast between the value propositions of *Take Control* (or *lean-forward*) and *Made for Me* (or *lean-back*) experiences, have parallels with Bertolt Brecht’s analysis of the contrast between the epic form of narrated story and the enacted form of dramatic theatre [11]. It is now apparent that there is scope to evolve the narrated form of storytelling, most common in factual television and radio, into a form of dialogue with the audience, enabling exploration of the subject matter during the media experience. Interestingly, Brecht wrote that epic theatre forces the audience to “make decisions” and contrasts it with dramatic theatre which enables the audience to “have feelings” which suggests how *lean-forward* and *lean-back* OBM experiences map to different affordances for the audience.

CONCLUSIONS

Our initial experiments demonstrated to us that the OBM approach had potential; *CAKE* used high production values, was published on Taster and brought visibility of OBM to production teams. This enabled further collaborations like *Origami Jumping Frog* and *Click*. The value of *Origami* was primarily in driving forward the functionality of the data model; it allowed us to focus on capabilities that supported a real-world use case, rather than imagining what production teams would want to do.

StoryKit has enabled us to collaborate in a more light-touch way and to enable multiple experiences to be built in little time. Workshops, such as Bristol Encounters put the tools into the hands of external users. This develops our community of practice, which will further evolve the craft of OBM content creation. Our collaboration with *Click* has demonstrated how OBM production is feasible for existing production teams. This brings further visibility to the work and provides evidence that producing and publishing OBM experiences is both practicable and affordable. In addition, the fact that the *Click* production team thinks that a responsive episode of their programme will benefit their audience increases our confidence in the value of OBM. Our commission with Spirit Media has allowed us to observe the production process, to understand how the tools fit in to production workflows. Overall, we have learnt that tool accessibility is critical: using *StoryKit* should be low-friction and people should be able to try it out with minimum effort.

Collaboration with production teams is very beneficial. It has driven our development and helped us understand how OBM production fits into workflows, but perhaps most important has been the message communicated to a wider audience. It has shown that this is something with value and that can be achieved now. Building the toolkit on the BBC’s cloud-based systems has required extra effort, compared to building stand-alone software, but has been very valuable. It has simplified internal tool accessibility; it gives us scalability and simplifies publication. It also shows that the OBM approach can fit within the existing



broadcast ecosystem. Highly-polished, relatively high-profile, examples are driving the uptake of OBM. Each step from CAKE to Origami to Click was dependent on what had gone before. It is necessary to create experiences with high production values to catch the attention of production teams as well as audiences. As a result, we now have a waiting list of BBC teams wanting to learn more about the tool and gain access to the system and we are aiming to release open source versions of the tools to reach the wider creative industry.

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