Bombastic and Made by Moon

—— **Bombastic** creates and tours dance, theatre and digital productions for children between the ages of four and eleven. Live work is performed in public venues and in schools.

—— **Made by Moon** craft interactive digital products and experiences. The team are experienced in designing across paper, web, tablet, mobile, gaming, TV or book – wherever ideas want to go.

—— **The Digital Innovation Fund for the Arts in Wales** is a strategic partnership between Arts Council of Wales and Nesta. It is the successor to the Digital R&D Fund for the Arts in Wales that ran from 2013-2015. The fund has supported arts organisations to experiment using digital technology to enhance audience reach or to develop their business model.

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Introduction

Can an interactive digital service for schools enable Bombastic to both increase its audience reach and reduce its reliance on public funding?

Increasing access to quality dance theatre and digital performance for primary school children is at the heart of Bombastic's philosophy. Digital technology has been integral to our work since the company was founded in 2007, collaborating with creative professionals who can bring digital expertise. We use it as part of our live productions, with performers interacting with digital animation, and we have created online digital games as companion pieces to our live shows.

But performing and touring tech-based work means big overheads and real limitations on regularity of contact with our audiences. Usually, we can only take our work out to schools once a year, which makes it more of a challenge to build relationships with teachers and children. We want to be a much more regular presence across the school year. Touring our work is our main source of earned income, so the limits on touring put a limit on the growth and development of the company.

Through this process of research and development we have begun to create a web-based subscription service to help us change that. Working with our technology partners Made by Moon, we have developed a prototype product that allows schools to access interactive digital content, relevant to the curriculum, that is projected onto classroom screens and delivered by tablet.

Our working title for this product is Live Hive.

Our strategic challenge

We want to make work that is creative and innovative, but also supports the curriculum in stronger ways than we have been able to until now. Bombastic's work in schools offers the following benefits:

— It provides opportunities and encouragement for children to express themselves creatively.

— It uses arts-based activities to promote engagement in subjects across the whole curriculum.

— It introduces children to the arts, particularly dance, theatre and digital arts.

We see the development of this product as a way of strengthening the educational impact of our work in all of these areas.

In the early stages of developing our idea, we conducted a survey of primary school teachers to ask them about their existing use of digital products in the classroom, and to test out response to some of our initial ideas. This suggested that many of the schools already had subscriptions to digital learning products and that, amongst this small sample, tablet computers were the most widely available hardware.

We also asked about what teachers perceived to be the potential benefits of our proposed service. Whilst encouraging creativity was seen as important, respondents identified meeting the requirements of the National Literacy and Numeracy framework as being more important and also ranked cross-curricular learning almost as highly.

This early-stage research helped us to develop a hypothesis as to the type of product that would be valued by teachers and schools. It encouraged us to pursue the idea of a subscription service, and underlined the importance of the product being relevant to the curriculum as well as encouraging children's creative expression.

Our hope for this project is that it will enable the company to achieve a greater audience reach compared to the current touring model, by combining conventional touring with the use of our product in the classroom, and by allowing us to develop relationships with more schools. Our early-stage research indicated that demonstrating the educational relevance would be critical to making it attractive for schools.

Alongside the development of the product itself, we have also explored the business model that would allow the company to translate a wider reach into new revenue streams and a reduced reliance on public subsidy.

Research Questions

We developed the following overarching research question:

Can an interactive digital service for schools enable Bombastic to both increase its audience reach and reduce its reliance on public funding?

To answer this question we investigated the following:

What features would the service need to have in order to be an attractive and viable offer to schools?

What options are there for creating an interactive digital product for the classroom?

What learning objectives can our service aim to achieve? How can our service usefully track the children's engagement and learning?

What changes to our business would be necessary to commercialise the new service?

Project Delivery

We carried out the following activities as part of our research and development:

Technology selection and content creation
Working with our technology partner, we created a prototype of the product to test the capabilities of the technologies we identified. Alongside this process, we worked with an educational specialist to identify the subject matter and plan the content for the prototype.

User testing round 1
Our first round of user testing took place with pupils in years 3 and 4 at three schools in South Wales. Each school put forward two classes and we engaged a total of 160 pupils. We gathered data through questionnaires with teachers and pupils, by classroom observation, and by conducting small group discussions with a selection of pupils.

User testing round 2
Our second round of user testing took place across two of the schools which had participated in our previous user testing, and with the same classes of year 3 and 4 pupils, a total of 95 pupils (at the time of writing the third school is yet to take part). We gathered data through questionnaires with teachers and pupils, through classroom observation and through semi-structured interviews with the teachers. We did, however, suffer from loss of data from the questionnaires due to a problem with internet connectivity, and only received 71 out of a possible 95 responses.

Market research
We commissioned a business advisor to help us in understanding the marketplace for educational technology, how we could position our own product, and helped us to consider the changes to our business model that might be necessary to support the product. The opportunity arose during the course of our research and development for us to carry out further market testing at two events we attended that focussed on new educational technology.

A full timetable and budget is included as an annex.

We made the following changes to project delivery:

Delays caused by school timetables:
We had to move the dates of planned user tests a number of times to respond to pressures on the school timetables. We had hoped to arrange the second user tests in December but this proved to be a challenging time to find a suitable date. Having moved the tests once, we then had to delay them again due to an Estyn inspection.

Re-filming content in response to feedback:
We initially created the content for the first two tests at an early stage in the process. However, in response to feedback from the first test we decided to re-shoot some of the video content, both to align more closely to the curriculum and to more clearly link the instructions to the activities on the pupil's devices.

Market testing opportunities:
There were two unanticipated opportunities for further market testing that arose during the research and development. We were invited to present our work at BETT, the largest education and technology exhibition in the UK, with a global audience. We also were successful in applying to EC Labs Bootcamp. This event provided an opportunity for us to present our work and get feedback from other educational technology entrepreneurs and from leading educationalists and investors.

Use of chatbots:
Our initial plan was to test the use of 'chatbots' as a way of providing the interactivity. Unfortunately, we decided that there were potential ethical issues related to the ability of chatbots to 'learn' from users. For example, the potential for unreliable spelling and poor use of language that would conflict with the fundamental aim developing literacy.

Use of livestreamed content:
Our initial plan for our third test was to test the possibility of using live streamed content to allow live interaction between pupils and our performers, over the internet. However, once we began to research the operational and financial implementation of our new product, we realised that this would be unlikely to be financially viable.

Prototype development

What options are there for creating an interactive digital product for the classroom?

We decided to create an interactive digital experience for the whole class that would work by connecting tablet devices used by the pupils and teacher. The lesson would centre on a series of short films interspersed with activities to test pupils' engagement and learning.

Technology selection

The main focus of the technological development was enabling this interaction between a group of devices. We considered two approaches – a product based around apps installed on each of the devices, and one based on the devices being connected over the internet.

We decided against the app-based approach, as this would require app software to be installed on the school devices by staff before the session. This would be time-consuming and could come up against IT policies and other practical difficulties. Instead, the product would be web-based, allowing all devices to connect using the browser already installed on the device.

Traditional web pages require the user to manually refresh the page or for the browser to repeatedly check the server for any new data. A recent web technology called websockets allows two-way communication between the server and connected devices. It means that the server can inform the connected devices of any changes in data without the connected device having to do anything.

We used a JavaScript framework called Meteor to implement the websocket functionality we required. Meteor uses a Node.js server as its webserver - this requires a web hosting solution that can offer this as not all hosting solutions can provide it.

For the second round of testing, we integrated the system with the games engine phaser.io. This allowed us to create simple drag and drop games which maintained the realtime reporting of results to the teacher. It also opens the possibility of creating more interactive game-like experiences in the future.

For hosting, we used Modulus.io with 2Gb of memory allocated. Through testing, we found that the 2Gb of memory is excessive we wanted to ensure the prototype works before tuning the servers.

Content creation

For the creation of the content for the prototype we worked with two writers and an educational specialist, as well as our performing artists.

For the purposes of our prototype we decided to focus on producing content to meet the Personal and Social Education framework for Wales (PSE). This subject area encourages the development of important social skills, including respect for others and active citizenship.

We developed a serialised approach, with a consistent set of characters and some continuity of storylines. Each lesson is focused on a specific subject area within the PSE curriculum. Through this process we developed many more final script ideas than we were able to include in the test itself, and these have provided us with additional material for continued development.

For our first two rounds of user testing, the content centred on the 'super local heroes': a quirky band of local residents who look to help others in their community. The pupils learn more about each character from one episode to the next, as well as learning about a new curriculum topic. In the first lesson we covered the topics of friendship and wellbeing, and in the second lesson we covered littering and recycling.

During the course of the testing we asked the pupils to contribute their ideas for new content. As well as asking during feedback, we also ran a session in one of the schools specifically for this purpose. We presented the broad topic areas and asked for their input into particular areas of focus, and asked them to contribute their ideas for storylines involving the super local hero characters. They put forward many imaginative ideas that we will use for the development of new content in the future.

How it works

— The application can be accessed by logging into the Live Hive website.
— The teacher selects an video to play on the class whiteboard.
— Pupils are then invited to connect their devices to the application.
— A filmed narrative with characters helps to guide the class through the activities.
— Using their own device the teacher can pause and play the video and activities.
— Pupils can participate through their own device, or collaborate as part of a group.
— Children are rewarded on completion of an activity.
— At the end of the session the teacher can review the pupils responses.

User testing round 1

What features would the service need to have in order to be an attractive and viable offer to schools?

This round of testing focused on the technology and the format of the prototype, whether we were able to successfully deliver the activity between a set of connected devices.

We carried out six user tests, across three schools. We helped teachers to set up the lesson, and they delivered it with their class whilst we observed. The intervention lasted 105 minutes, with the lesson itself lasting between 45 and 55 minutes.

Data gathering
For this trial we gathered data in the following ways:

Observations: We observed the tool being used in the classroom and collected observations under four headings – technical, programme content, teacher interventions, pupil engagement.

Questionnaires: We asked teachers and pupils to complete electronic surveys towards the end of the lesson.

Children's focus group: We selected a small number of children to take part in a group discussion to gather their views in more depth. These discussions were recorded for analysis. The rest of the class were invited to write down words to describe the session.

Children's response
The majority of pupils appeared to be engaged and to be enjoying themselves during the lesson. Some of the specific questions and activities seemed to cause confusion, although we felt that these could be amended relatively easily to be more clear.

In the pupil's questionnaires, the enthusiasm was clearly evident for the majority of pupils. Most could identify learning outcomes and described the lesson overall in positive terms. As well as receiving feedback on specific features of the lesson we also asked some more general questions.

The majority of the pupils suggested that the activities were too easy, with a small group saying that they found the activities too hard. A small number of pupils suggested that they found parts of the lesson confusing or difficult to follow.

In the children's focus group, the pupils were able to describe their favourite part of the films, describing them in some detail. They found it more difficult to name the characters, and in some cases were uncertain of what they had learned about in the films.

The children identified this activity as being different from their normal lessons. Though we noted that some children suggested that they liked using the tablets because they don't like writing on paper.

The children suggested that some of the questions were ambiguous – they were confused when they got a question wrong because they didn't agree with the answer. This was hotly debated. Many also commented that they thought there was not enough time given to answer the questions.

The children also had a number of suggested improvements:
— More characters, including characters from other cultures.
— More detailed and challenging activities.
— Access to the content at home as well as in school.

Teachers' response
The teachers involved had significant teaching experience, of between 14 and 25 years. Their feedback was broadly positive, with the understanding that the tool was at a prototype stage and further development was planned of the activities and the links to the curriculum.

They told us that they felt the pupils were engaged and motivated by the activity. They also suggested that the vocabulary and the pacing could be further tailored to suit the broadest range of pupils.

The link between the teacher's controlling tablet and the pupils' devices appeared to work well and allowed the teacher to see how the pupils were responding. Some of the teachers did comment on the need to have playback controls to allow them to control the pace of the lesson, to repeat activities if necessary and to re-start the activity from any given point.

They commented that the whole class format was a positive feature – often they would only have a small group of pupils using the tablets at any one time. They told us that this could be useful for assessment purposes and for involving the pupils in decision-making.

The teachers told us that the prototype was easy to use but we received some feedback that they would need more help setting up the lesson if doing so independently.

We observed that the prototype format worked best with the active involvement of the teacher. For example, some of the questions and answers were considered to be ambiguous by some of the pupils. In these instances, teachers were able to use the discussion around the meaning as an opportunity for learning. Similarly, some of the transition screens caused a loss of pace in the lesson but some teachers used these as an opportunity to re-focus the children's attention.

User testing round 2

What learning objectives can our service aim to achieve? How can our service usefully track the children's engagement and learning?

This round of testing introduced a wider range of activities to the product, and focused on refinement of the content's alignment with the curriculum.

Data gathering
We delivered this round of testing with the same teachers, classes and schools as the previous test, although at the time of writing the third school had yet to take part and therefore the data relates to only four of the six classes. As with the previous test, we gathered observations and asked teachers and pupils to provide feedback via an electronic questionnaire. Instead of the children's focus group, following each lesson we conducted semi-structured interviews with the teachers. During this time we captured some written and recorded feedback from pupils.

Childrens' response
Our observations and the questionnaire responses suggested a high level of engagement and enthusiasm amongst the pupils. In the questionnaire, around one-third of the pupils gave universally positive feedback, and a further third gave positive feedback to more than half of the questions. Around two in ten of the pupils gave a positive response to less than half of the feedback questions, and a further one in ten did not give any positive responses.

Around half of the pupils said that they found the activities too easy, and around one-third said they found them neither too easy nor too hard. This suggests an improvement on the previous test but also that there may still be scope for more challenging activities. A very small number of pupils, fewer than one in ten, said that they found the activities too hard, and around two in ten said that they found the lesson confusing or difficult to follow.

In this questionnaire we also began to look at other factors that might influence pupil's engagement in the lesson. We asked a small number of questions related to factors known to influence engagement in education more broadly, namely their attitudes towards school, and their peer relationships. We also asked questions about their access to technology at home. At this stage these are very crude measures and would not be suitable for drawing firm conclusions but they have been useful in helping us to develop some hypotheses for testing in the future.

We have compared children's responses to feedback questions to their responses to the questions about attitudes towards school and peer relationships. Although, as discussed, it is not possible to draw firm conclusions at this stage, there appeared to be a strong correlation between levels of positive feedback and both sets of factors. The correlation in this respect was stronger than, for example, whether they found aspects of the lesson 'boring' or difficult to follow.

This suggests that there may be some benefit in exploring ways that we can help teachers ensure that those pupils who might have additional barriers to engagement in education get the maximum benefit from our product. There may be, for example, ways that the material for the whole class can be supplemented with additional material that can help to reinforce their learning separately from the whole class activities.

In three of the four classes, pupils shared devices. The split screen enabled both pupils to answer some voting questions independently of their partner and other activities required them to work collaboratively. In the fourth class, pupils each had their own device and were able to work alone. Whilst some pupils preferred working alone, many seemed a little isolated and were hesitant about their answers referring to others in the class for reassurance.

We also expected to find a relationship between access to technology and positive feedback towards the lesson, however at this stage there was no such pattern evident in the data we collected.

Teachers' response
The addition of semi-structured interviews with teachers, conducted immediately following the test session, allowed us to gather more detailed information about their perspectives. We were able to hold interviews with three of the four teachers, all of whom were engaged in both this round and the previous round of testing.

The teachers felt that we had improved the set up process to make it quicker and easier than the previous test. They did still comment that they would need a prompt sheet for them to follow, including instructions of the lesson format, activity interventions and control requirements to ensure smooth pace of the lesson. The fact that the product came already set up was seen as an advantage, and they identified the additional preparation time required when using digital products as a potential barrier – setting up devices, checking they are working, producing classroom resources to accompany the activity.

User testing round 2

The teachers we spoke to were able to identify other products with somewhat similar features they had used in the past, although none had access to this technology in their current school. They could identify other digital products that can guide the children through activities by remote control, whilst giving the teacher oversight of what each pupil was doing on their own device.

As with the previous test, the teachers were broadly positive about the prototype, and felt that the arts-based content was engaging for the pupils. The immediate feedback for both the pupils and the teacher was considered to be a positive feature, that the children were motivated to get the answer right and that it is easier to monitor than a paper-based activity.

The highly visual and tactile nature of the lesson was considered to be potentially advantageous for engaging visual and kinaesthetic learners, though they also noted that the literacy levels of some children made it difficult for them to take in the written content in the time available. The ability for the teacher to decide whether children will work independently, in pairs or groups or as a whole class was seen as a useful feature.

They welcomed the focus on PSE, although they did comment that it would be important that the tool also maximised opportunities for addressing literacy and numeracy, and felt that it was important for the content and activities to be aligned to the Welsh Government's Digital Competency Framework. They commented that it would be beneficial to clearly link each of the activities with specific learning outcomes and in some cases were unclear as to the relevance of some of the activities. One way that was suggested of improving this link would be to include a short film after the activities and before the pupils see their score.

Teachers also highlighted the importance of being able to track learning through the tool for assessment purposes. They highlighted this as being one of the main potential advantages of digital products, as automating any part of the assessment process could generate valuable time savings.

The market for arts-based educational technology

What changes to our business would be necessary to commercialise the new service?

We attended two educational technology industry events to gather additional feedback about Live Hive.

The first of these was Educational Changemakers Bootcamp, an opportunity for new educational technology businesses to have their products reviewed by peers, by industry experts and by investors.

We also exhibited at BETT, a large educational technology trade fair in London, attended by 30,000 delegates from across the world. We were able to give demonstrations of the prototype, collecting feedback cards as well as having conversations with delegates from as far afield as China and Malawi.

In tandem to the process of gaining this feedback from the education and technology sectors, we commissioned Martin Price, of consultancy.coop, to help us to consider how to establish ourselves in the market. He identified the process by which primary schools buy digital products, who the decision-makers are, and some of the major suppliers of digital products to primary schools. He helped us to consider what our options would be for developing a new business model to support the continued development of our new product.

He identified three methods for selling to the education market:
— Directly to schools on a one-off basis.
— Directly on a subscription basis – a monthly or annual fee providing some level of support and inclusive updates.
— Indirectly via a company that takes responsibility for the distribution, a company which already has a portfolio of products available for schools.

The first two methods require a secure delivery platform, i.e., a means of accessing the products via the internet, to prevent unauthorised redistribution of the product. They also require a sales and marketing operation. The third method requires provision of the product and a process for keeping it up to date, whilst the security, marketing and sales are in the hands of the distributing company.

Whilst the first of these two methods are the most lucrative per download, it is possible that the third option would be the most profitable as the distribution company is able to achieve economies of scale by selling many different products at once.

Our business advisor also set out options for changes to the structure of the business for consideration by our board. He suggested the creation of a 'Special Purpose Vehicle,' a separate legal entity for the purpose of supporting the delivery of Live Hive. This could take a number of different forms, including:

a) A company limited by shares (CLS) with Bombastic as the only shareholder in the first instance. This format allows investors in future to inject finance and take ownership of all or part of the company. Profits are paid by dividend to the shareholders in the proportion in which shares are held.
b) A company limited by guarantee (CLG) in which there is only one member - Bombastic. This company could borrow money, but investment by a third party is not possible.
c) A limited liability partnership (LLP), registered at Companies house between a third party and Bombastic with Bombastic providing the IP and the third-party investment. The partnership agreement would itemise how the profits would be split.

Next steps

Can an interactive digital service for schools enable Bombastic to both increase its audience reach and reduce its reliance on public funding?

Through this process of research and development we have created a prototype of an interactive digital service for schools that we believe has significant artistic, educational and commercial potential.

To become a fully functioning platform suitable for income generation and third-party investment there is a need for a significant amount of technical development. There is also investment required for further content creation.

We are keen at this stage to further expand the content available through the product to make it a viable offer for schools. There is a need for a programme of work to be available that schools can access on an ongoing basis. As well as expanding the content relevant to the PSE curriculum, we see scope for developing material for use in other subjects as well.

In the medium to long term, we are looking to develop a larger-scale educational study to fully evaluate Live Hive's impact on promoting learning and engagement with the arts.

In terms of the business model, the board are considering the transfer of the ownership of the intellectual property to a new, independent company limited by shares. An agreed amount of shares will continue to be held by Bombastic, providing the basis for the product to generate an income stream for the company.

This marks the beginning of an exciting new phase for Bombastic. In the last ten years we have developed considerable expertise around engaging children in arts and education. The development of Live Hive has enabled us to use technology to create new ways of sharing that expertise with more schools than our touring model has allowed in the past. We hope that the further development of the product will provide us with the basis for our work to have an impact for more children, promoting creative expression, educational attainment, and engagement with the arts from a young age.

Annex

Project team

Sean Tuan John, Artistic Director, Bombastic
Project manager
Sean Tuan John is one of Wales' most successful independent choreographers and directors, who over the last 23 years, has been creating dance/theatre and film projects that have been screened and performed in festivals around the world. Sean is a recipient of two major Creative Wales awards from ACW and been regularly commissioned by theatres and cultural organisations in Wales and beyond for outdoor large-scale productions. Since 2007 he has been Artistic Director of Bombastic creating and developing multidisciplinary work for the stage and digital platforms for young people, which have toured extensively in Wales and England. Sean is currently a Research Fellow in drama, dance and the performing arts at the University of South Wales. He is investigating, through practice as research, the construction of a new critical framework to analyse contemporary dance in relation to other radical contemporary movements in the associated arts of performance, visual arts and film. Sean has worked in Television and Film with various projects including directing and performing in *'The Ghost of Me'* BBC Wales, *'The Boy who Never Came Back'* for BRT Flemish National Television and recently on the National Theatre Wales' *'The Passion'*. He has also acted as a movement director for actors/models for music videos, most recently on the Disciples worldwide hit *'They Don't Know'*.

Geraldine Hurl, Chair of the Board of Trustees, Bombastic
Lead researcher
Geraldine has developed a professional career working as a dance specialist particularly in the fields of professional development and training, community dance and dance education. She has worked for several key dance organisations in Wales including Powys Dance, Rubicon Dance and Cardiff Metropolitan University (UWIC) where she was responsible for the development, implementation and direction of the first single honours dance degree in Wales. She has gained a wide range of experience across many dance disciplines: choreographer and performer, dance lecturer, teacher, facilitator, and trainer.

In support of her work as a dance artist practitioner, she has developed skills in management, project development and administration. Currently working as a freelance dance specialist and consultant, Geraldine is an assessor for Trinity College London for the Diploma in Dance Teaching and Learning and is External Examiner for the Diploma in Dance Teaching Studies at the Royal Academy of Dance. She has undertaken several research and evaluation projects for dance organisations (Rubicon, Bombastic, Ballet Cymru) and is currently developing an Evaluation Strategy for Rubicon Dance as well as carrying out the evaluation of Bombastic's Live Hive Digital Innovation Project. She is Chair of Board of Directors for both Earthfall and Bombastic. And she still likes to create and dance as a member of Striking Attitudes, a professional and community-based dance theatre for the older dancer.

Will Richards and Andrew Price Made by Moon
Based in Cardiff, Moon is a design and technology studio that creates interactive experiences for the changing landscape of web, mobile, tablet, TV and other connected devices. At the heart of our strategy are real people, from the initial sketch, through the planning and the early prototypes we want to help, engage and entertain an audience with the work we produce. We build tools, explore technologies and look to innovate to make something as compelling as it can be. Will Richards and Andrew Price and who have worked for a number of organisations including BBC Wales, Cardiff University and National Theatre Wales founded Moon. Moon recently collaborated with Taika Box on Please Switch on Your Mobiles Phones, developed through the Digital R&D Fund for Arts in Wales.

Lesley Dancey
Lesley is an experienced primary school teacher who has also worked on implementing and developing educational programmes/schemes in primary schools in Wales and has worked with Bombastic on a number of educational research and consultancy roles.

Timetable and budget

Date	Description / Outcome	Who	Expenditure (£)
Jul-Sep 2016	Creative content development	Artistic director Writer Educational specialist	5950
	Tech costs	Moon	1350
	Tech development	Moon	6000
	Educational researcher		1500
Sep-Nov 2016	First Production phase, rehearsals, filming, post production	Various creatives	6000
	Tech development		4000
	Creative content development	Artistic director Writer Educational specialist	2800
Nov-Jan 2017	Second production phase costs, rehearsals, filming, post production		4350
	EC bootcamp + BETT conference		5000
	Creative and educational content development	Artistic director Writer Educational specialist and educational researcher	6800
	Tech development	Moon	4000
Jan-Mar 2017	Third production phase costs, rehearsals, filming, post production		7000
	Tech development	Moon	8000
	Creative and educational content development	Artistic director Writer Educational specialist Educational researcher	5250
July-March	Company costs/office costs/Social media costs included	Bombastic	5000
	Total Costs		73000