

## Developing the Brighton Waste House: from zero waste on site to re-use of waste



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### Summary

In 2014 the author completed Europe's 1st permanent public building made of (approximately) 90% material discarded by others. Known as the 'Brighton Waste House'<sup>i</sup> it was designed and built by over 360 students, apprentices and volunteers. It also has full Planning and crucially UK Building Regulations Approval. However, it was initially going to be a completely different project. It was originally conceived as the re-build of 'The House that Kevin Built' from 2008.<sup>ii</sup>

Frustrated with the lack of knowledge, and indeed interest, around issues of sustainable design within the UK construction industry, the author was keen to create a 'live' teaching project that included young learners, practitioners, educators, contractors and suppliers in the process of design and construction. The premise being that if the challenge was to deliver a truly innovative building, and that if the 'innovation' in question addressed on some of the many issues under the umbrella title of 'Sustainable Design', then a greater understanding, of said issues, across practices within the design and construction industry, would perhaps be attained.

**Keywords:** Re-use, sustainable materials, collaborative learning

## 1. Introduction

### 1.1 Themes influencing the research.

1.1.1 The UK generated 200 million tonnes of waste in 2012. 50% of this was generated by construction. Commercial & Industrial activities generated 24%, with households responsible for a further 14%.<sup>iii</sup>

1.1.2 Approximately 20% of all material arriving on building sites ends up incinerated or going to landfill and 30% of this is new material never used. Finding ways to reduce or eliminate waste from the construction process could help reduce environmental destruction from mining etc., as well as add value to material resource currently defined as waste.<sup>iv</sup>

1.1.3 Many large corporations such as Apple Inc., Caterpillar Inc., Kingfisher plc and others are very concerned about resource security and high levels of taxation associated with corporate responsibility (including dealing with waste/ end of life products)<sup>v</sup>. They are taking issues of re-use and by association principles laid out in 'Cradle to Cradle'<sup>vi</sup> very seriously. The Circular Economy

has the potential to galvanise industries that are looking to make money providing services and goods while working in harmony with Planet Earth.

1.1.4 Proving that material currently discarded as waste can make a contemporary public building that performs to very high standards will draw attention to its potential as a valuable resource, potentially reducing the amount of waste created in the future, changing construction techniques to promote low waste alternatives such as off-site fabrication, designing for demolition/ remanufacture, while creating new jobs within this sector.

1.1.5 Learning about designing and constructing buildings is often undertaken in academic and vocational 'silos'. The need to share research data whether academic or 'at the goal face' from a 'live' construction site is particularly important in the UK as many so-called 'low energy' projects do not perform as well as expected when occupied.<sup>vii</sup> The need to understand and then to meet the challenges offered by designing and constructing in an authentic 'circular' or sustainable manner is hugely challenging and currently very difficult to achieve. Getting the whole design team (designers, makers, suppliers and constructors) to work together in a completely inclusive manner in order that they might learn together and from each other, and to document the outcomes from this project is perhaps the main objective of this on-going project.

## 2. Methodology

### 2.1 'The House That Kevin Built' 2008

The House That Kevin Built or 'THTKB' was designed utilising two construction systems that promoted the use of timber and plant-based materials. Interestingly both systems were designed by Architects passionate about creating genuinely sustainable developments, with a consideration about the amount of CO<sub>2</sub> emissions and energy consumption associated with the manufacturing process. Both systems specified locally sourced sustainably managed material.

The first system is known as Modcell<sup>®</sup>. These are prefabricated panels constructed of highly engineered 400mm deep (front to back) timber box frames in filled with either Limecrete<sup>®</sup> or straw bales. We used the straw bale system as these heavy weight panels, that exhibit both high levels of insulation and thermal mass, were constructed near to the building site in a barn that Modcell<sup>®</sup> refer to as a 'flying factory'. Modcell<sup>®</sup> assemble their engineered frames in the farmers barn and then buy straw from her/him to infill the panels before finishing them off on both sides with lime render. Modcell<sup>®</sup> can then legitimately claim to be specifying local organic materials. Modcell<sup>®</sup> panels (approx. 3m wide and 2.7m high) weigh about 1.5 tonnes each, so we used them on the ground floor of THTKB.

We then specified a lightweight ply box construction system using 12mm ply sheet. This system, known as Facit<sup>®</sup>, was fabricated using a computer controlled CNC Laser cutter. The first floor walls and roof were designed with 3D CAD software. Every Facit<sup>®</sup> box was individually numbered and cut out with the CNC laser cutter. There was virtually no wastage as the computer ensured that as many panels as possible were cut out of each sheet. The computer ensured an amazing degree of accuracy resulting in no errors on site and therefore no waste material. We used the same CAD system and laser cutter system to create the louvered rain screen cladding to finish off the upper floor external walls. These two systems (Modcell<sup>®</sup> and Facit<sup>®</sup>) were assembled on site in less than three days and created the external fabric of the house. The Facit<sup>®</sup> boxes were filled with cellulose insulation made from waste paper blown into pre-drilled holes in the boxes.

The roof was finished in an array of solar tiles creating electricity and hot water for the under floor heating system. These solar panels were some of the first to be fully integrated into a roof and form the actual waterproof layer.

## **2.2 THTKB: The re-build.**

THTKB took just 6 days to construct. It was filmed and aired each evening on UK Channel 4 TV to over 5 million viewers as 'Grand Designs Live'. Although a success in as much as this innovative construction project was completed and built on time, the author was frustrated that there was little understanding of why this project was in fact innovative. THTKB was dismantled two days after completion and put into temporary storage.

The author was keen to rebuild THTKB within the grounds of the University of the Brighton where he taught architecture. This would allow the process of re-constructing this unusual to involve architecture, design and construction students, and finally to ensure that this inclusive process became an innovative and effective pedagogic tool.

In 2011 the University of Brighton gifted a piece of land that would locate the project within the campus of the Faculty of Art & Humanities, which crucially was placed in central Brighton. This positioning was crucial to facilitating another ambition for the project, i.e. that of public accessibility. It was envisioned that THTKB would be a community 'hub', a place shared by academics and students from the university, as well as local community groups, businesses and schools.

## **2.3 Developing the design thesis.**

In the spring of 2012 the author had a three-month sabbatical from teaching that allowed him to develop the concept of the re-build project. At this time the author met with Diana Lock from Re-Made South East, a government-funded organisation charged with getting larger companies and corporations to reduce the amount of waste their product created in manufacture and crucially in-use. Lock told the author that many large multi-national corporations were very concerned about 'resource security' as well as the cost of the ultimate disposal of their products. Companies were looking at ways to avoid relying upon buying large amounts of raw material, as well as avoiding sending their products to landfill or incineration, in order to make or sustain their profit margins, or in some enlightened cases, to reduce their burden upon Planet Earth's natural resources. The sensible money was investing in the world of the 'Circular Economy'.

It became apparent that to prove that it was possible to construct a building using waste material it was crucial that this project would not be another temporary shed or bus shelter. We had to create a permanent building, with very high levels of energy efficiency that attained Full Planning and contemporary Building Regulations Approval.

In August 2012 the author called a mini "waste summit" where he met Cat Fletcher who helped form FREEGLE UK "an exchange for unwanted stuff" with over 2.2 million subscribers. The author and Fletcher, together with Dr. Ryan Woodard, a Research Fellow at The University of Brighton who has been working in waste management research for over 15 years, together with Gant and Lock, contrived a plan for redesigning the build so that it was constructed of waste and surplus material from the construction industry. Following Fletcher's suggestion, they also considered collecting items of waste material currently flooding domestic waste sites; material such as VHS videotapes and CD's. The idea developed from that of focusing only on waste from the construction industry, to a project that would raise awareness of how wasteful we all are going about our everyday domestic lives. This would open up the project to a bigger audience as well as change it

from an exemplar construction project that could directly inform the construction of many other buildings, to a project more akin to a polemic, a thought provoker, or as RIBA Awards Judges noted: *“The Brighton Waste House has sufficient scientific integrity to be taken seriously by the construction industry and just enough political clout to influence recycling policy. It is clear this interesting project will continue to question important issues of recycling that affect everyone”*.

Source: RIBA Jury citation ‘The Stephen Lawrence Prize 2015’

#### **2.4 Developing the detail design.**

It was agreed that this building, which is actually university teaching accommodation, not a house at all, should be designed to be as energy efficient as possible. Due to the unusual constraint of being built with waste the design team didn’t try and deliver a design that met Code for Sustainable Homes or BREEAM requirements. Instead environmental engineers ran an IES (Integrated Environmental Solutions) digital model to set energy efficient ‘benchmarks’ relating to the site, the programme, the form & orientation, levels of ‘U’ Values required through the external fabric, as well as ideas for the cost effective primary energy source (conventional and renewable). It was decided that the building would be all-electric as far as heat and power were concerned due to services constraints on site. The mechanical, electrical and power installations would be designed to be as efficient as possible: the building would not show an array of ‘green technologies’ as many ‘demonstration eco houses’ do as these buildings are often over complicated and too expensive. We wanted to prove that this low energy building made of waste would be cost effective, fuel efficient, and that it could be built on time and on budget.

The first challenge was to decide on the design of the load-bearing walls or frame for the building. The team had previously been successful at sourcing second-hand timber from skips and ply sheeting from large top tier construction contractors for temporary pavilions exhibiting student architects work. So it was decided to take advantage of this by designing a timber and ply frame comprising 400x400mm section beams and 400x400mm section columns at approximately 2.5m centres. In between the columns we designed 400mm deep, 900mm wide and 2400mm high ply boxes (like cupboards). We called these boxes ‘cassettes’, which would later prove a bit confusing. However, it was these cassettes that provided the opportunity for collecting and in effect storing waste material from sources other than the construction industry.

A 4kW array of photovoltaic solar panels sits on the largest South-facing facet of the roof. It provides approximately 25% more electricity than the building requires over a year.

Current Building Regulations ‘U’ Value levels for the roof, external walls and ground floor were achieved by applying ‘returned’ and/ or damaged polyurethane insulation (normally used in the construction of buildings) secured to the outer face of the 400x400mm timber box frame and ‘cassettes’. This 400mm external ‘wall zone’ was used for ‘storing’ waste material, either heavyweight material providing internal air temperature stabilising ‘thermal mass’ or lightweight material providing, to various degrees of success, additional insulation. All walls were to be monitored for condensation, temperature and off gassing.

External windows and doors were supplied as new high performance units. Second-hand units are not easy to source and their thermal effectiveness could not to be relied upon.

The design of the foundations and ‘over-site’ was agreed as low carbon concrete, i.e. concrete with a 40% reduced cement content (replace with pulverized fuel ash) plus aggregates from demolished concrete buildings. It should be noted that the Local Authority Building Control was hugely

supportive of this project allowing us to develop the rest of the design during the construction of the building. The Building Control Officer even attended design development meetings on site.

## **2.5 The Construction Team.**

The Mears Group, a national contractor charged with servicing and maintaining a large percentage of UK's social housing stock, contacted the author in early 2011 stating that they were keen to help build the project as they had a healthy apprenticeship scheme in Brighton and wanted their apprentices to work on the project. In the spring of 2011 the Mears Team stabilised the ground on site, constructed the foundations, installed the drainage and cast the ground floor slab for the Waste House. Whilst completing these works their apprentices help architecture students on an adjacent site on the same campus build the first temporary pavilion to show final year projects in the graduation show. This process was such a success that Mears decided to help build the rest of the Waste House. Mears also agreed to provide an experienced site agent to run the construction site, together with their apprentices. We planned to start works on site in the autumn of 2012.

It was during this period that the author had a fortuitous meeting. He went to meet tutors delivering construction courses at City College Brighton and Hove, as he wanted to see if they could construct a glue-laminated timber beam for the roof of the building. City College couldn't make a glue-lam beam, but they wanted to build the Waste House as every year they build the equivalent of a new in their three story workshops. In addition to this the team employed Cat Fletcher of FREE-GLE UK to source waste material for the project. We had our team.

## **3. Results**

### **3.1 The construction & learning process.**

Mears took control of the construction site and were responsible for security, coordination and all aspects of health and safety. In addition Mears supplied up to four apprentices every day. However they were on standby to do 'normal' Mears work on nearby housing estates, so they would often have to leave site. Mears were our 'Main Contractors'. In addition to this we had City College student carpenters, electricians, plumbers, bricklayers, decorators etc. supervised by their qualified tutors. They were our 'Sub-contractors'. City College students would be on site two or three times a week, although the site agent wouldn't know if he had two students to work with or thirty. Managing a construction site with an unknown number of relatively untrained sub-contractors was one of the biggest challenges for this project. Despite this the building frame was constructed within 3 months by students in City College workshops and then assembled and completed by 360 students, apprentices and volunteers on site in only 12 months. In addition we had specialist suppliers who would often install their products or systems in partnership with our young constructors and their tutors.

During the on-site construction period there was a Volunteer Summer School Camp that ran from June 2013 until September 2013. Over 50 students completed the most challenging part of the construction process during this period, i.e. the vaulted roof structure. 25 of the volunteers were City College students, and another 25 were architecture students, with many of those from the Interior Architecture School. This was perhaps the most profitable time as far as skills and learning exchange amongst students, apprentices and the one or two professional trades people we had on site. It was the one period of time where design students could spend three, four, maybe six weeks in a row working on site. Some of these committed design students became so adept at their new trade that they ran small teams of volunteer carpenters on site; teams that included City College carpentry students. It was during this time that Mears promoted five City College students to Ap-

prentices because of their work on our project. A number of our students received Achievement Awards from Mears.

We also welcomed over 750 pupils from local primary and secondary schools, as well as other technical colleges from around the South East. This unusual learning environment was completely facilitated by our immensely patient site agent David Pendegrass who had to do a Health & Safety Induction for every person who arrived on site, whether they wanted to work or simply visit, and remember he also had to get the Waste Hose built on budget and on time. This he did.

### **3.2 Locating appropriate waste material.**

The author would meet the construction team on site every week to check progress and identify materials and products that needed to be sourced. Often the conversation would involve the site agent and Cat Fletcher. There were basically two strategies put into place to find material. The first strategy was the conventional one. Mears, BBM and City College Brighton & Hove employed their contacts and networks within the construction industry to source second-hand, surplus and waste construction material. The second strategy was less conventional. Cat Fletcher used her FREEGLE UK social media networks (FREEGLE UK has over 2.2 million subscribers with 18,000 in Brighton & Hove) to locate waste material. Individuals, local authorities, building contractors & suppliers, schools and businesses from all over UK supplied the project with materials such as 25,000 toothbrushes from Gatwick Airport, 2 tonnes of waste denim, 4,000 VHS video cassettes, 4,000 DVD's.

In addition the author sourced waste material from demolition sites his practice BBM were working on. UK VAT rules dictate that retrofit and extension works to residential properties attract VAT at 20%. However new-build residential projects are 'zero rated' and attract no VAT. BBM were working on a project where the VAT was in excess of £360,000. The client instructed that his home be completely demolished for less than £10,000 to avoid this VAT. BBM collected timber from the demolition and re-used it to form the vaulted roof structure of the Waste House.

### **3.3 Utilising waste from the Waste House.**

It is estimated that over 40 tonnes of waste was diverted from landfill or incineration by constructing the Waste House. However the process of constructing the Waste House created waste material. Whenever possible we set up projects using this material. Architecture students created designs and built them after locating and using waste from the Waste House. In addition a local 'zero waste' restaurant called 'Silo' constructed tables and shelving from surplus material from the Waste House. A local community group used waste material to create chairs, and an allotment shed in Hollingdean used surplus carpet tiles, vinyl banners and timber from the Waste House.

### **3.4 Specifying new material and products.**

There are a number of products and systems that contemporary buildings require where it is not possible to install as second-hand. Electrical circuits comprising wire stripped out of buildings will require too many joints or junction boxes to be reliable. Second-hand above and belowground drainage and waste pipes are technically a health hazard and not appropriate to re-install without a professional cleaning operation. We sourced second-hand light fittings: five of them from a scrapped 60 years old container ship. However light bulbs have to be new. In short it is difficult to install what the construction industry calls 'first fix' services: piping work and wiring. However the 'fittings' such as sinks, wc pans, IT equipment, Mechanical Ventilation and Heat Recovery system, and even flat screens for presentations were second-hand and straight forward to sourced.

### **3.5 Achieving Building Regulations Approval.**

As mentioned earlier, Brighton & Hove City Building Control were very supportive and an integral part of the design team, attending design and progress meetings. Installing dvd's, videos, and denim into external wall cavities does not test Building Regulations as they are separated from the internal environment by the internal wall linings. The Waste House is constructed primarily of timber and ply sheets with various second-hand plastics acting to a greater or lesser extent as low-grade insulation. Most homes built in the UK in 21<sup>st</sup> Century are timber framed with plastic insulation infilling wall cavities and plastic vapour control membranes sitting behind internal plaster or timber wall linings: pretty similar to the Waste House in fact.

The most challenging aspects for the Building Control Officer were proving the fire and flame resistance of the 2,000 second-hand carpet tiles used for external wall cladding, and the ply wall linings used in the main first floor studio. To satisfy these queries we set up a test rig of 15 carpet tiles fixed on a brick wall, as they would be installed on the Waste House. In the presence of the Building Control Officer our site agent directed a hand-held blowtorch onto the tiles for 5 seconds and then for 10 seconds. On both occasions the tiles started to smoke quite heavily. However as soon as the blowtorch was taken away the tiles immediately extinguished.

The first floor wall linings were more straightforward. They were constructed of third-hand ply sheet that had previously been used by the team to create a 9m high 'waste totem' at EcoBuild 2013. Material for the totem had to be flame proofed before it was decorated with second-hand paint and installed in the exhibition hall. This flame retardant ensured that we could re-use this material as the internal wall finish of the first floor studio space without any fear of Building Control not approving it fit for purpose.

### **3.6 The academic legacy.**

Since the spring of 2011 the themes and challenges embraced by the Waste House have been influencing the core delivered curriculum of the undergraduate architecture and interior architecture courses at the University, as well as at in partner institution City College Brighton and Hove. Baker-Brown coordinates architecture 'technology' and 'practices'. Both modules used the process of designing and then constructing the Waste House as an inspiration, awareness raiser, and vehicle to deliver RIBA approved learning outcomes.

Architecture students considered design projects tackling issues associated with valuing waste as a resource, as well as broader issues relating to the Circular Economy. One undergraduate architecture student designed a timber construction system that inspired the 'cassettes' used in the Waste House. Construction students from City College completed learning modules of their carpentry, electrics, plumbing, brick laying, plastering, decorating and maintenance by working initially in the workshop, but then crucially on the 'live' construction site. Both the author and Fletcher delivered lectures to both City College construction students as well as architecture students as part of their core curriculum. They also gave presentations about waste and designing for a circular economy aimed specifically at children and young learners as young as 6 years old. As part of the university's on-going Widening Participation Programme over 750 young people were shown around the construction site during the construction period they presented to.

Students from regional tertiary colleges visited the site, as well as other students from the School of Science and Engineering. Since its completion the Waste house host's regular school visits on Wednesdays where open design workshops are held.

While on site a Jordanian PhD student approached the University asking if he could be involved in the digital monitoring of the external wall fabric. He moved to UK to do just this.

Since the inception of the project in 2010 the University of Brighton has hosted a website focusing on the development of the Waste House as an idea through to completion. It is regularly updated and serves as an archive and learning resource.

In March 2013 the author and Gant curated a 3-day seminar entitled 'The WasteZone'<sup>viii</sup> where 12 guest speakers discussed the idea of waste as a valuable resource from many different perspectives. The Waste House team also designed and erected the 9m tall 'Waste Totem' drawing the attention of the 65,000 visitors towards issues of Re-Use. Since this event UBM who own 'EcoBuild' have started up a new re-use themed 'zone' of their own called 'Resource' situated within the larger exhibition. We feel that we may have had a small role in enabling that to happen.

The Waste House also hosts the University of Brighton's Sustainable Design MA with students working in the first floor studio 2 days a week. Prof. Jonathan Chapman and Nick Gant have their office on the ground floor. Community groups, local schools & other educational establishments, as well as local and international businesses, and local authority groups use the Waste House. The building hosts meetings, lectures and symposia with large construction contractors as well as commercial enterprises such as Body Shop and Marks & Spencer's.

This is an on-going research project, involving new generations of students being set projects testing, improving and updating the Waste House whose performance is being constantly monitored by the School of Science and Engineering.

However perhaps the biggest legacy the Waste House project leaves is that of raising awareness of the negative issues associated with society's linear, throwaway, consumer-led lifestyle. The building has many stories associated with the materials collected and residing within it. For example an airline cabin service company at Gatwick Airport collected 25,000 plastic toothbrushes for the project in only 4 days. These statistics stop you in your tracks are it were, and we believe get you thinking about where stuff comes from and where it currently ends up. Perhaps it will also get more people realising the potentials for re-use and more particularly the potential for designers to play a huge part in our future Circular Economy, and of course to understand "that there is no such thing as waste, just stuff in the wrong place". Source: treehugger.com 2011

Since it opened in June 2014 over 400 articles have been published around the world, in newspapers, on tv & radio as well as on many websites. The project has attracted an enormous amount of interest.

### **3.7 Capturing the design and construction process.**

We commissioned a graduate from City College Brighton & Hove's film school to record the whole process and edit approximately 25 short films. An additional 20 short films were shot of the completed building explaining the reasoning behind the design decisions as well as the many stories behind the sources of the materials used. All films were put on line on the Waste House website which went live at the beginning of the build and is still 'live' and updated.

## **4.0 Lessons learnt.**

4.1 That designing structural beams and columns using second-hand, waste and surplus material raises unusual challenges for a structural engineer. If you don't know where the timber materials originate from you won't know the stress grade and therefore the actual strength of the product. Our structural engineer therefore had to assume it was the weakest material on the market. This initially manifested itself in a draft design from the engineer that suggested larger structural beams and columns than normal. This design proposed using far more material than would be normal. It was only when the design was refined over a number of weeks, so that it became more specific to the actual loads on each structural member, that it became more material efficient.

4.2 In addition, during the manufacture of these elements the structural engineer had to oversee and approve every structural element in the workshop: they were constructed by young people with as little as two months time spent on a carpentry course.

4.3 The team designed a timber-framed building assuming we could source over 400 sheets of waste ply and approximately 2km of timber studwork: we had after all done this before when constructing temporary graduation pavilions. However in 2012 we were not able to do this as it rained during every month. Initially we were receiving water saturated and delaminated ply that was not appropriate to use. It took the team two months to find damaged ply suitable to use and delayed the project. We learned to find material first and then think about how it might be useful or not, instead of designing while assuming materials would be available: a completely different process to normal.

4.4 Materials would often be offered weeks or even months before they were needed. It was crucial to the success of this project that we could store material keeping in safe and dry. Brighton & Hove City Council let us borrow a building nearby to use as a temporary resource store.

4.5 If properly briefed and supported, young people with limited skills and experience within the construction industry, can construct a building using unusual materials that performs at very high levels of energy efficiency.

## 5. Conclusion

The Brighton Waste House started out as a design & build project, as well as an inclusive learning process to prove that construction waste and surplus material was worth salvaging and not throwing away. Via further research and a policy of inclusive design the project evolved into more of a polemic rather than an exemplar for the UK housing industry to copy. The Waste House is a vessel containing hundreds of stories associated with the salvaged materials it contains. These stories and narratives that run through the project resonate through the building and ensure that students, consultants, academics, and whoever asks questions when they use the building, will know more about where stuff comes from and where it normally ends up, and then perhaps they might ponder upon how things might be done differently: how our unintelligent 'linear economy' that finds materials, processes it into things that we then throw away, could be changed into a 'circular economy' where materials and goods are in a state of perpetual re-use.

The Waste House acquired over 40 partners during its development. Many of these partners are able to use the building. Schools visit the Waste House and take part in sustainable design workshops with designers, poets, writers, artists and constructors. The University of Brighton's MA in Sustainable Design is based in the building, and many community groups use it as well.

The unusual external fabric of the building is being monitored to see how it performs compared with more straightforward materials. This information will be published in due course.

Over 450 articles have been published around the world via newspapers, web-based magazines, tv and radio. This project has got people speaking about waste as a valuable resource. To date it had won 10 awards and is currently nominated for 5 more. It appears to have struck chord.

The author is currently writing a book entitled 'The Re-Use Atlas: a designers guide towards a circular economy'. This book has been inspired in part by the research undertaken by the author as his colleagues, as well as future initiatives such as 'Resource Mapping' or 'Harvest mapping' where architects redefine what is meant by 'locally-sourced' materials by including existing waste, overlooking, surplus material and resources literally lying around near to or on the development site (including valuing the existing buildings themselves).

The Waste house still inspires student on campus as new generations are encouraged to add their design ideas to the building. It is an on-going 'live' research project. It has also ensured that the team comprising different academic and vocational establishments, the local authority and local contractors are currently bidding for European grants for future collaborative innovative construction projects, and the idea of a 'Live Projects Office' is a reality for the Faculty of Arts and Humanities.

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