3d medical, food, fashion and lastly architecture

Business, Industries

3D printing-How it is going to save the world..

?(withspecific application to disaster relief) Matthew SmithTheUniversity of HertfordshireBSC(Hons)Industrial DesignDegree Essay: 6CTA1075 IntroductionWith the birthof 3D printing in the early 80's, the emerging technology has struggledto find its way within mainstream manufacturing that isstill highly dominated by the demand of mass production through meanssuch as injection moulding. However, 3D printing has proven an asset within specificniche's throughout industries. A few of these includemedical, food, fashion and lastly architecture and disaster relief. Disaster aid as a whole has it'slimitations. As disasters are usually unique and unpredictable, it makes itvery hard to properly prepare and respond efficiently. Thedifficulties come from the time it takes to gather the appropriate resources andfunding that the effected zone needs, in time to make a difference to those inneed. The Application of 3D printingwithin disaster relief is small and very specified.

NGO's such as Field Ready with3D printing small useful parts that have been broken or are in high demand. However, the same limitations still apply tothese scenarios. The amount of time it take to get a printer to a zone alongwith the appropriate resources still holds the same problems. However, theability to print on sight and to demand, means more raw materials can beshipped as is and manufactured at the area of effect. Specifically withinshelters the bed of the print as well as the structural integrity is not goodenough to replace that of a temporary shelter such as a tent or shanty town These issues cannot be fixed with thecurrent availability of technology that is possessed today. However with thegrowth of applications such as

carbon fibre printing, and the possible futureof a shift from mass manufacturing to 3D printing may cause a chain reactiontowards a more realisable and cost effective solution to the ability to printeffective structures. Chapter 1Within its current state, 3D printinghousing structures is a concept that's been heavily explored in the recent years.

The push towards alternative construction methods can be demonstrated worldwide through the use of current ongoing projects. With structures such as the Dutch Canal House funded by an international teamof partners. This experimental project set out to push the limits of what ispossible with 3D printing in regards to architecture, it's referred to in thedescription of their website" Abeta-preneurial building project, which has the goal to revolutionizethe building industry and offer new tailor made housing solutionsworldwide.". This project separates itself from the regular constructionmethods of prefabricated concreate with the appeal of customisable structurefor the user, without the added expense and labour needed in traditional methods.

The same can be said about wastage and transport costs. As structures can bebuilt on site there is no expenses on specific tooling or transport making itbetter for the environment as well as cheaper for the production costs. However on the other sideof this, trying to maintain a quality building that complies with theprevailing regulations of safety standards, such as the following; " insulation, fireproofing, wind loads, foundations...these, aswell as the possible materials to print with (using this printer) are allthings that are being researched and investigated". Theserestraints are currently what's

holding this project back, further research andfunding is underway to find solutions to these problems. The current technologythat makes their vision realisable, “ The XL 3D Printer” is what they refer to as an upscaledversion of the Ultimaker (A common desktop 3Dprinter that works by printing layer by layer). The current materials they are usingand developing are bioplastics.

“ We aim to print with a materialthat is sustainable, of biological origin, melts at a relatively lowtemperature, and of course is sturdy and stable.” – Q5 of FAQ in . They are currently printingwith a material developed by Hankel, that consists of 80% vegetable oil calledMacromelt. It seems the main intent for this project is to prove you can builda better more sustainable house, with greater efficiency both in price and time; while still maintaining a structure that does not comprise practicality orstyle.

Another Good exampleof the current capabilities of 3D printing design structures is also based in Amsterdam. This project driven by Eindhoven University ofTechnology, proves that thephysical limits of 3D printing can compete with that of regular manufacturing techniques. The construction of a 3D printed concreate bridge, according to an interview articlein the Guardian “ has some 800 layers, took about three monthsafter starting in June and it is made of reinforced, pre-stressed concrete”. Inparallel to the previously stated Dutch Canal House, this project helps eliminate excess material wastageby only printing what is needed, while still maintaining its vital structuralintegrity. A very similar project to this is a 3D printed bridge built by MX3D, a technology driven startup company, attempting to also

prove the physical limitsof 3D printing can compete with that of regular manufacturing techniques, notjust in concrete.

This bridge underwent multiple design phasesand experiments. These included 3D printing with steel, a process that combineswelding with an old manufacturing robots hardware, and further sophisticatedprogramming to accomplish a working steel 3D printer. Essentially makingaluminium extrusions and manual welding within bridge making obsolete. Thisproject is trying to create a bridge from scratch, that will build itself onsite using these robots. This project is particularly interesting as it eliminatesthe need for manual labour, where the other two examples still require somedegree of assembly.

Aside from the designer(s)/engineer(s) that programmed andcreated the bridges printable file. No labour is needed in the construction ofthe structure. Besidesthe Netherlands, a leading country in 3D printing is China. Currently Chinese companyHuaShang Tengda have managed to 3D print a two story, four hundred square meterhouse in approximately a month and a half.

The process consists of building aframe with all the pluming and electronics housed within, then the building isprinted around the frame with their large duel nozzle printer. The materialused is nothing new, as stated in the article outlining HuaShang Tengda’s project, “ The printing material itself is ordinary Class C30 concrete, anextremely tough, durable yet inexpensive material, and HuaShang Tengdastates that any cement material can be used with the process, so that otherconstruction firms can take advantage of what is

locally available. WinSun Now thatthe current state of 3d printing for shelters and in disaster zones has beenexplore lets look at the current limitations that effect these from moving furthertowards a realisable solution.