Chapter 6

Development of 3D manufactured firearms

6.1 One of the most fascinating aspects of this inquiry was the issue of 3D manufacturing.[1] In particular, this inquiry was concerned with the development of 3D manufactured firearms.

6.2 While chapter 4 discussed the current situation with regard to the regulation of firearm parts and accessories more generally, this chapter will look at whether the current state and territory laws sufficiently cover 3D manufactured firearms and firearm parts.

What is 3D manufacturing?

6.3 In order to understand the impact that 3D manufacturing will have on society, it is important to first understand the concept. The World Intellectual Property Organization (WIPO) has provided a good explanation:

> 3-D printing, alias additive manufacturing (AM) or direct digital manufacturing (DDM), makes it possible to create an object by creating a digital file and printing it at home or sending it to one of a growing number of online 3-D print services. In the 3-D printing process, this digital blueprint, created using computer-aided design (CAD) software, is sliced into 2-dimensional representations which are fed through to a printer that starts building up an object layer by layer from its base. Layers of material (in liquid, powder or filament form) are deposited onto a "build area"and fused together. This additive process, which minimizes waste because it only uses the amount of material required to make the component (and its support), is distinct from traditional "subtractive" manufacturing processes where materials are cut away to produce a desired form.[2]

6.4 WIPO noted that there are a number of techniques used to print 3D objects:

> A number of 3-D printing techniques exist. The first commercial 3-D print technology, stereolithography, was invented in 1984 by Charles Hull. Several other techniques have emerged since, including fused deposition modeling (FDM), selective laser sintering (SLS) and PolyJet Matrix. Some of these techniques involve melting or softening layers of material, others involve binding powdered materials and yet others involve jetting or selectively-hardening liquid materials.
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> The process of "growing" objects layer by layer also means that, with 3-D printing, it is possible to create more intricate and complex structures than can be done using traditional manufacturing techniques.[3]

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1 In this report '3D manufacturing' and '3D printing' refer to the same manufacturing process and are used interchangeably.

2 C Jewell, '3-D Printing and the Future of Stuff', WIPO magazine, April 2013.

3 C Jewell, '3-D Printing and the Future of Stuff', WIPO magazine, April 2013.

6.5 While the concept of 3D manufacturing was originally developed for rapid prototyping purposes, developments which have improved its accuracy, speed and quality have led to it being used for a wide range of purposes:

> The technology is already widely used to make jewellery and other bespoke fashion items, in dental laboratories to produce crowns, bridges and implants, as well as in the production of hearing aids and prostheses, offering patients a perfect fit. 3-D printing is particularly suited to low–volume, short production runs offering companies a more flexible, cost–effective and speedy alternative to traditional mass production methods.[4]

6.6 Dr Angela Daly, from Swinburne University, spoke to the committee about the beneficial aspects of 3D manufacturing in a number of areas including manufacturing, industry, medicine and arts and design.[5] She noted that it is probably at the industrial level where societies like Australia are benefiting the most from 3D printing.[6]

6.7 Mr Michael de Souza, the Chief Executive Officer of the Australian 3D Manufacturing Association, spoke about some of the developments that have occurred, particularly in biomedical fields:

> At the ANFF in Wollongong, we are world leaders in what we call additive manufacturing and additive research and development. The additives are the 'inks', as they are referred to. You are talking about absolutely anything that you can touch, see, breathe or feel. It is already at a molecular level, because everything base carbon, and once you break it down to a molecular level and begin to rebuild it, you can produce anything as an ink. They have managed to print live human cells. Prior to that, you could print the cell—a plant cell, animal cell or human cell—but the issue has been that the printing process kills the cells. There is now a way, developed by Gordon Wallace at Wollongong University, to actually protect that cell in a gel and, as the cell or cells begin to reproduce and collectively join a matrix, that gel dissolves and away you go. So you have human, animal, and plant tissue regenerating itself, which is of course fantastic for organs, burn victims' skin and all sorts of things like that.[7]

6.8 As part of its inquiry, the committee had the opportunity to visit Objective 3D, a commercial 3D manufacturing facility in Melbourne. While there, the committee learnt about the important role 3D manufacturing is playing with respect to Australia's broader manufacturing industry.

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4 C Jewell, '3-D Printing and the Future of Stuff', *WIPO magazine*, April 2013.

5 Ms Angela Daly, Postdoctoral Research Fellow, Swinburne Institute for Social Research, *Committee Hansard*, 14 October 2014, p. 20.

6 Ms Daly, Swinburne Institute for Social Research, *Committee Hansard*, 14 October 2014, p. 20.

7 Mr Michael De Souza, CEO, Australian 3D Manufacturing Association (A3DMA), *Committee Hansard*, 31 October 2014, p. 24.

6.9 Examples were given of some of the many products which can now be printed, including prosthetic limbs for amputees and anatomical models for use by medical students. Anatomical models have also been used for pre-operative planning, for example, in the case of conjoined Bangladeshi twins Krishna and Trishna, a bespoke 3D printed model was used by doctors to plan surgery to separate their fused brain and skull tissue.

6.10 The committee toured Objective 3D's facility and viewed a number of 3D printers, including one in action (see Figures 6.1 and 6.2). Due to technological advancements, 3D printers have both increased in their sophistication as well as reduced in cost (some printers are now a third of the cost of those a decade earlier). The committee was fascinated to observe the processes used to manufacture 3D items and would like to thank Mr Matt Minnio of Objective 3D for his time and expertise.

Figure 6.1: Committee members inspect a 3D printer

Figure 6.2: Viewing a 3D printer in action

The development of 3D printed firearms

Current situation

6.11 The invention and expansion of 3D manufacturing means that the production of firearms in this way is now a reality. The Australian 3D Manufacturing Association noted that 'as 3D printers and manufacturing processes have become increasingly available worldwide, so too have 3D printed firearms components and accessories'.[8]

6.12 It was suggested to the committee that 3D manufactured firearms currently do not pose a particularly high risk to the community.

6.13 Mr Nicholas Jenzen-Jones, Director of Armament Research Services (ARES) commented that 3D manufactured firearms had started to gain significant media attention when Defense Distributed built its fully printable, single-shot polymer "Liberator" handgun.[9] He emphasised that while the idea of being able to instantly print a firearm sounded alarming, at this stage, a degree of expertise is still required:

> I think it is really important for me to stress that the state of technology, as it stands today, is not click, print and fire. You cannot simply download a

8 Mr De Souza, A3DMA, *Committee Hansard*, 31 October 2014, p. 5.

9 Mr Nicholas Jenzen-Jones, Director, Armament Research Services (ARES), *Committee Hansard*, 31 October 2014, p. 5.

> file, hit print on your printer and come out with a functional firearm. There is a degree of hand-finishing, there is a level of technical expertise, I understand, that is involved in producing the firearm in the first place; and, of course, once it is complete, there is no guarantee that it is going to function correctly unless it is correctly assembled and so on. So, while it does perhaps remove from the watchful eye of law enforcement some of these people and their ability to purchase or acquire firearms, it is not distinctly different from people being able to go to the hardware store, purchase components there and assemble them in their backyards.[10]

6.14 He also advised the committee that manufacturing 3D firearms from metals remained rare and was incredibly expensive:

> There are functional handguns available commercially in very small numbers in the United States that have been produced almost overwhelmingly using the direct metal laser sintering process. It is not economically viable. Those handguns sell for US$11,900 each, where a comparable handgun, in terms of capability and design, can be purchased in the United States for about US$300 or US$400. Clearly, there is a big gap there. The biggest hurdle for a criminal organisation or a non-state armed group seeking to produce metal 3D-printed firearms would be the cost of the printers themselves. Currently they are not economically viable for the consumer grade.[11]

6.15 ARES also discussed the possibility of whether criminals and armed groups were already using 3D manufactured guns as part of their operations.[12] ARES found that such groups, including those operating in Australia, already 'routinely produce a range of improvised firearms from various materials using traditional or improvised manufacturing methods'.[13] ARES argued that these weapons have more advanced capabilities than 3D printed firearms produced outside defence facilities, and that there is not yet a demand for 3D printed firearms:

> At this stage the only benefits that an economically viable 3D printed weapon may hold for an individual or a non-state group seeking illicit weapons lie in their untraceable nature and the polymer construction that prevents many common screening devices from detecting them—for example, in order to smuggle a weapon inside a secured area. When the costs of purchasing or producing 3D printed firearms are considered, together with their operational limitations, traditional firearms purchased on the black market and those produced by traditional manufacturing methods illegally are likely to remain all the more appealing to individuals and non-state armed groups for the foreseeable future. Barring significant

10 Mr Jenzen-Jones, ARES, *Committee Hansard*, 31 October 2014, p. 6.

11 Mr Jenzen-Jones, ARES, *Committee Hansard*, 31 October 2014, p. 7.

12 Mr Jenzen-Jones, ARES, *Committee Hansard*, 31 October 2014, p. 6.

13 Mr Jenzen-Jones, ARES, *Committee Hansard*, 31 October 2014, p. 6.

> technological advances, advanced 3D printed metal firearms will remain beyond the reach of those seeking illicit weapons for many years to come.[14]

6.16 The Australian 3D Manufacturing Association agreed with this assessment:

> I think the most important thing to note is that the media has somewhat sensationalised the gun story. The important thing is the fact that today, in the real world, with respect to the technology that is available for producing a gun—I am talking about outside; let us discount people like the US military and all these people we do not even know and will probably never know for years are doing—you would need several million dollars, several very clever designers, employees, engineers, scientists to be able to create a genuine weapon that would be effective. The devices that can be created today—you have seen this in the media and the police have tested these products—are more likely to kill you than the person you are aiming the device at. Can they be called a gun? You put a bullet in it so, if you want to call it a gun, okay, but where that bullet is going to go is debatable. With today's technology, could someone do it at home? No, not really. Would it be effective? No. Would it be accurate? No. Would I fire it? Absolutely not. I would not be anywhere near it. With today's technology, and keeping it in the topic of discussion, our position is that with the equipment, the machinery, the printers that are available today it is not reasonable to say that you could produce a gun per se that could do that sort of damage.[15]

6.17 The Australian Crime Commission (ACC) stated that it 'has not identified or been informed of law enforcement discoveries of 3D fabricated firearms being used or made by criminal entities in Australia'.[16]

Future challenges

6.18 While the use of 3D manufactured firearms in criminal activities appears at present to be negligible, some witnesses identified possible challenges for law enforcement with regards to firearms produced in this way.

6.19 The Victims of Crimes Assistance League argued that criminal groups are already exploring the uses of 3D manufacturing technology and this is of significant concern:

> My concern with 3-D printing is not with responsible manufacturers at all. My concern goes to people such as outlaw motorcycle gangs. I am not sure whether the committee is aware, but as recently as last week police arrested three people in the outer western Sydney region who were involved in the manufacturing of illicit firearms, and they were using small die-cast equipment and foundries to manufacture illegal firearms. That is my concern with the 3-D printing. We have looked at the examples cited by Andrew Scipione, for example, with one of the handguns where after the second shot the weapon tended to explode in your hand, which I would

14 Mr Jenzen-Jones, ARES, *Committee Hansard*, 31 October 2014, p. 6.

15 Mr De Souza, A3DMA, *Committee Hansard*, 31 October 2014, p. 22.

16 Australian Crime Commission (ACC), *Submission 75*, p. 6.

> have thought would have been somewhat of a disincentive. However, as I said, criminals are not particularly bright, so it may be they do not understand that.[17]

6.20 This was a view shared by Victoria Police, which stated 'we have varying organised crime groups—Middle Eastern organised crime, outlaw motorcycle gangs—that are quite innovative and adaptive in their approaches to their organised crime activities'[18] and:

> As technology is refined, and with 3D printers and other machines like a computer numerical control (CNC) machine becoming more readily available and affordable, it is likely that 3D printing of firearms will increase, posing a significant risk to community safety and law enforcement agencies.[19]

6.21 The United Nations Secretary-General has also acknowledged in a recent report that while 'weapons theft or purchase on the illicit market may require less effort than printing an effective, reliable weapon', this may change once production costs decrease and the quality of 3D printed firearms improves.[20]

6.22 The ACC predicted that advances in technology could lead to 3D manufactured firearms posing more of a threat:

> The ACC has assessed that 3D fabricated firearms will probably pose a low threat for at least the next two years. This is because of the current limitations of technology result in a low quality product, firing capability is unreliable, and development is complex and costly. However, decreased costs and advances in technology associated with machinery and manufacturing programs sourced from the internet will likely increase the quality of illicitly manufactured firearms and components within Australia in the future.[21]

6.23 The Australian Federal Police (AFP) also noted that the technology was advancing quite quickly and at some point would 'allow the production of metal objects similar to the way that plastic ones are currently produced'.[22]

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17 Mr Howard Brown OAM, Vice-President, Victims of Crime Assistance League, *Committee Hansard*, 13 October 2014, pp 11–12.

18 Detective Superintendent Peter De Santo APM, Commander, State Anti-Gangs Division, Victoria Police, *Committee Hansard*, 13 October 2014, p. 58.

19 Victoria Police, *Submission 389*, p. 3.

20 United Nations General Assembly, *Report of the Secretary General: Recent developments in small arms and light weapons manufacturing, technology and design and implications for the implementation of the International Instrument to Enable States to Identify and Trace, in a Timely and Reliable Manner, Illicit Small Arms and Light Weapons*, 6 May 2014, p. 5.

21 ACC, *Submission 75*, p. 6.

22 Assistant Commissioner Julian Slater, National Manager, Forensics, Australian Federal Police (AFP), *Committee Hansard*, 31 October 2014, p. 74.

6.24 Queensland Police confirmed that these concerns are a reality and described a recent property search that led to the discovery of 3D printed weapons parts:

> The search resulted in investigators recovering a loaded sawn off .22 calibre rifle. The firearm, previously a long arm (rifle), had been modified to enable it to be concealed on a person. The search also resulted in officers locating four plastic bags containing major component parts for firearms. The component parts included the receiver, trigger assembly and cylinder/barrel. Officers identified there were sufficient parts to construct four concealable weapons, each constructed to hold and discharge up to six .22 calibre projectiles. The weapons parts had been manufactured through the utilisation of a 3D printer, where the devi[c]e would 'print' the component parts for assembly by the user. Officers also located a set of knuckle dusters which had also been 'printed' by the device.[23]

6.25 The 3D printed firearms parts located by Queensland Police were able to be fired:

> The defendant admitted he had constructed and test fired one of the weapons, indicating it had worked and discharged a .22 calibre round. The defendant had however strength issue in the 'printed' model and had set about rectifying the problem by re-enforcing the cylinder with metal tubing. The inclusion of this metal tubing would mean the weapon could have been reloaded and repeatedly used.[24]

6.26 Significant concerns associated with 3D manufactured firearms and firearm parts produced from polymer resin are their disposable nature and the difficulty of detecting them with traditional methods. ARES spoke about these challenges,[25] informing the committee that not only are 3D manufactured firearms easy to replace, they are 'comparatively easy to incinerate'.[26]

6.27 ARES also discussed whether 3D manufactured firearms are able to be detected using traditional means such as metal scanners, body scanners and X-ray:

> The polymer 3D printed firearms in particular such as the Defence Distributed Liberator have already been successfully smuggled into a few secure locations—primarily by journalists seeking to test the security mechanisms. There are some technologies for which the polymer nature of the handgun will allow the weapon to be brought into secure areas. These are primarily metal detectors. Whilst these polymer frame handguns cannot be detected by metal detectors, they can still be detected by X-ray machines and backscatter X-ray body scanners.[27]

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23 Queensland Police, *Answer to written questions on notice*, received 25 February 2015.

24 Queensland Police, *Answer to written questions on notice*, received 25 February 2015.

25 Mr Jenzen-Jones, ARES, *Committee Hansard*, 31 October 2014, p. 6.

26 Mr Jenzen-Jones, ARES, *Committee Hansard*, 31 October 2014, p. 6.

27 Mr Jenzen-Jones, ARES, *Committee Hansard*, 31 October 2014, p. 70

6.28 Dr Daly commented that technological advances have allowed anyone who has access to a 3D printer, raw material and the relevant design files to make an undesirable object:

> The problem for regulation and enforcement of the law with regard to these objects, whether we are talking about laws relating to control of weapons, health and safety laws or even intellectual property laws, is the decentralised nature of 3-D printing. The whole 3-D printing process can essentially take place in the privacy of individuals' homes. One way of regulating the 3-D printing process might be to target entities such as the printer manufacturers; the design repositories, which tend to be websites where people upload 3-D printing designs and others can download them; and internet service providers, given that a lot of this process happens online. One way of regulating might be to ensure that they must only handle certain kinds of approved files.[28]

6.29 Dr Goldsworthy acknowledged that 3D manufacturing highlights a number of issues for law enforcement authorities and, given the availability of the technology and the motivation for criminals to manufacture 3D printed firearms, the government should be on the front foot.[29] The regulation of 3D printed firearms is discussed in the next section.

Regulation of 3D firearms

6.30 As with the majority of technological developments, 3D manufacturing offers not only exciting and hugely beneficial possibilities for the community, it also poses challenges for governments and law enforcement authorities. Before additional measures and controls are imposed, it is important to examine the state of the existing legislation.

Current legislative framework

6.31 There is currently no Australian legislation that goes specifically to regulating 3D printers and associated materials. As the ACC stated:

> 3D printers and materials are not subject to federal regulations as they have widespread legitimate applications. There is no offence in possessing or using a 3D printer. The ACC notes that firearms produced using new technologies are still subject to the licensing and registration requirements with any other firearm. [30]

6.32 Internationally a number of instruments apply, as ARES explained:

> Rapid advances in 3D printing technology and their increased application in the manufacture of firearms and firearms components raises a number of legal, normative and law enforcement questions. In general, national,

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28 Ms Daly, Swinburne Institute for Social Research, *Committee Hansard*, 14 October 2014, p. 17.

29 Dr Terry Goldsworthy, Assistant Professor, Criminology, Faculty of Society and Design, Bond University, *Committee Hansard*, 14 October 2014, pp 17–18.

30 ACC, *Submission 75*, p. 6.

> regional and international controls apply to 3D printed firearms in the same way they apply to traditionally manufactured firearms. New technology will pose new challenges for law enforcement, however.
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> It is important to note that 3D manufacturing will not render current international and national controls on firearms obsolete. It may, however, make applying these norms more challenging. As additive manufacturing technologies continue to improve and become more readily available to private individuals, the enforcement of firearm manufacturing regulations will become increasingly difficult. Additive manufacturing techniques could be used to produce controlled accessories or components.[31]

6.33 Some witnesses suggested that Australia's existing firearms laws would apply equally to 3D printed firearms. The Attorney-General's Department (AGD) stated that:

> …our understanding of this area of 3D printing or creating of firearms is that it would be treated no differently to traditionally manufactured firearms, and that importation, manufacture or possession of a 3D printed firearm, without a licence, would be illegal in Australia.[32]

6.34 The Law Institute of Victoria (LIV) considered this issue carefully and found that the manufacture of firearms by way of 3D manufacturing was likely to be considered an offence in all Australian jurisdictions:

> It appears that the current firearms statutes (and, where relevant, weapons statutes) in combination with the *Customs Act 1901* and import regulations sufficiently covers the possession and manufacture of all firearms, including those made with the use of 3D printers or from separately imported parts.[33]

6.35 However, the LIV also noted that due to each state and territory having its own laws with regards to the registration of firearm parts and the manufacture of firearm parts, it is impossible to be certain without judicial consideration whether the legislation in all Australian jurisdictions will sufficiently cover 3D manufacturing of firearms.[34] Given these jurisdictional inconsistencies and the rapid changes in 3D manufacturing, the LIV recommended 'that it would be desirable to introduce and implement a uniform set of regulations in all Australian jurisdictions'.[35]

Suggestions for further regulation

6.36 It was the view of some submitters that the law needs to keep pace with technological advances. For example, the Australian 3D Manufacturing Association stated:

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31 Mr Jenzen-Jones, ARES, *Committee Hansard*, 31 October 2014, p. 5.

32 Ms Catherine Smith, Assistant Secretary, Crime Prevention and Federal Offenders Branch, Attorney-General's Department, (AGD) *Committee Hansard*, 31 October 2014, p. 59.

33 Law Institute of Victoria (LIV), *Submission 124*, p. 11.

34 LIV, *Submission 124*, p. 7.

35 LIV, *Submission 124*, p. 11.

> I think the fact that we have seen over the past 20-odd years the problems that have occurred with trying to regulate the internet and put laws in place. I think part of that was because we started way too late. If we can work collaboratively today and develop standards from the get-go, then we are going to be in a much better position to be able to look at those things as the years go by.[36]

6.37 As noted in paragraph 6.32, a number of international instruments apply to 3D printed firearms in the same way they do to traditionally manufactured firearms, but the development of 3D manufacturing technology will pose new challenges for law enforcement.[37]

6.38 The Victims of Crimes Assistance League shared a similar view:

> Until we can keep pace with that, we are going to have a situation where someone is going to be shot and injured with the use of a 3-D device, and we are going to have all sorts of problems getting that matter through the courts because of the failure of the courts to keep pace with that technology. We need to address it, and we need to address it before it becomes a problem, not after it becomes a problem, which is traditionally what the law does.[38]

6.39 Submitters were generally opposed to either banning, or introducing a character test, for the ownership of 3D printers. The LIV noted that this was a 'drastic option' and that it 'would caution against introducing new legislation that is so broad and encompassing that it addresses every possible scenario in the future'.[39]

6.40 Dr Goldsworthy noted that by preventing people from engaging in illegal activity, you would also prevent beneficial discoveries for society:

> …3-D printers are multipurpose and most of them are quite legitimate and not illicit. So therein lies the problem of how you regulate something that is going to be used quite legitimately in most of the opportunities versus the small amount of times it may be used inappropriately. I think that is the real challenge we are facing here.[40]

6.41 Dr Daly similarly cautioned against over–regulation:

> …any attempt to regulate 3-D printing: that it would be largely ineffective and disproportionate to the potential harm of dangerous objects, such as guns. I propose that, due to some concern about guns, we should not allow a moral panic to stifle the large benefits from 3-D printing for society at large. There should be some hard evidence regarding the prevalence of 3-D

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36 Mr De Souza, A3DMA, *Committee Hansard*, 31 October 2014, p. 24.

37 Mr Jenzen-Jones, ARES, *Committee Hansard*, 31 October 2014, p. 5.

38 Mr Brown OAM, Victims of Crime Assistance League, *Committee Hansard*, 13 October 2014, p. 14.

39 Mr Albert Yu, Co-chair, Young Lawyers Section, Law Reform Committee, LIV, *Committee Hansard*, 14 October 2014, p. 15.

40 Dr Goldsworthy, Bond University, *Committee Hansard*, 14 October 2014, p. 18.

> printed weapons and the threat of these weapons to Australia before any new legislation is considered. There would also need to be consideration given to whether any such regulation would be effective in practice.[41]

6.42 However, in her submission, Dr Daly suggested three possible ways in which 3D printing could be more moderately regulated:

- use of 'gatekeepers': place obligations on 3D printer manufacturers and online design repositories to only allow for approved files to be used on their machines or present in their folders through technical protection measures;
- private regulation: examples include Danish 3D printing firm Create It REAL which recently announced it had developed a firearms component detection algorithm which can give 3D printers the option to block gun parts, and the decision of Mega to take down the Liberator gun blueprint; and
- role of internet service providers: require companies to report when users download 3D printing design files that relate to firearms.[42]

6.43 The LIV was supportive of similar approaches,[43] while Dr Goldsworthy noted that recent proposed changes to Australia's telecommunications regime could be used to regulate 3D printing.[44]

Copyright and intellectual property

6.44 The rapid development of 3D manufacturing technology offers huge benefits to the community in terms of industry, medicine, creativity and many other areas of human endeavour. It is also clear that it poses challenges for law makers and law enforcement authorities when it comes to the manufacture of potentially dangerous items such as firearms, as has been discussed elsewhere in this chapter. During the course of the inquiry, it also became apparent that 3D manufacturing technology will pose challenges with respect to copyright and other intellectual property issues.

6.45 The Australian 3D Manufacturing Association explained:

> Although 3D manufacturing has been around for many, many years, it is only due to the lapse of patents and copyrights recently that has brought the technology into the fore…It is such complex technology. As I alluded to before, it has come to the fore because of the lapse of copyright, patents and all of these things that were not previously in the public domain. You would have had to pay millions, tens of millions of dollars to get hold of the technology. All of that technology is now coming out into the public domain.[45]

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41 Ms Daly, Swinburne Institute for Social Research, *Committee Hansard*, 14 October 2014, p. 17.

42 Ms Daly, *Submission 393*, pp 4-5.

43 LIV, *Submission 124*, pp 8-9.

44 Dr Goldsworthy, Bond University, *Committee Hansard*, 14 October 2014, p. 19.

45 Mr De Souza, A3DMA, *Committee Hansard*, 31 October 2014, p. 22.

6.46 The committee considers these issues are beyond the terms of reference for this inquiry. On that basis, the committee believes that there is scope for a further and more extensive inquiry into 3D manufacturing technology and the opportunities and challenges it offers.