

Results from 3D Printing survey 2013

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Introduction & summary

This is the second in a series of longitudinal surveys on the 3D printing community. The results of the first survey in 2012 can be found [on this site](#) and [in a First Monday article](#). Since the previous survey, several interesting developments have taken place in the 3D printing environment, including but not limited to:

- Emerging 4D printing (<http://www.webpronews.com/heres-everything-you-need-to-know-about-4d-printing-2013-05>)
- Networked 3D printing - 3D hubs (<http://www.3dhubs.com/>)
- Lots of Kickstarter projects for new 3D printers (<http://www.kickstarter.com/projects/search?term=3d+printer>)
- 3D printable gun (http://reviews.cnet.com/8301-33809_7-57560076/makerbot-purges-3d-printable-gun-parts-from-thingiverse/)
- Case Thingiverse terms of use (<http://blog.hackerspaces.org/2012/09/23/the-makerbotthingiverse-move-to-the-dark-side/>)
- Initiatives for easier scanning and clean-up (<http://www.popsci.com/gadgets/article/2013-08/finally-easy-way-3-d-scan-and-print>)

3D printing technology is advancing, and at the same time there are important developments in terms of making both the software and the hardware easier to use. The visibility of 3D printing in media has been high throughout the year. Looking forward, these trends can be expected to continue. One expected game changer is the [expiration of 3D related patents 2014](#).

In view of the previous results, we find that the most interesting trends in the 2013 survey are:

1. increase in the number of different models of 3D printers used
2. increase in the number of different 3D printing services used
3. growing economical interests: 3D Printer manufacturing market polarization, new manufacturer startups and kickstarter driven 3D printers
4. possible signs of maturing ecosystem and that 3D printing might be on the verge of spreading outside geek communities despite the lacks in hardware and software.

Background of the survey

In this longitudinal survey, we approach 3d printing as an example of the open source inspired landscape of peer production. The aim of the survey is to gain a view into the development of the demographics of the 3D printing community, and the changing patterns of production, keeping especially in mind the expectations that 3D printing is a part of an emerging “revolution in manufacturing”. Research around 3D printing as an example of commons-based peer production is still minimal (but see Troxler , Moilanen & Vadén). The approach in the current research has concentrated in defining the overall change and analysing most prominent features. Statistical studies of 3D Printing community are still missing. This research aims towards that direction by continuing the longitudinal series started 2012.

Research settings and methods

The research is built on surveys. Surveys will be conducted annually, forming a longitudinal data base about 3D printing community, members of it, and features of the community. We have included both 1) people using 3D printers and people who 2) develop 3D printers and related software.

The former group refers to people who print objects with 3D printers but have no interest or skills to make any development either on software or hardware. This group contains also people who use 3D printing services like [Shapeways](#) and [Ponoko](#). Shapeways and similar services also represent a kind of commons-based peer production since the models and ‘things’ sold in webshops are made by a large population of people who participate (at least mostly) voluntarily. They create the content. The same situation can be found in the other group too. The second group (technology developers) contains those who make contributions, software or hardware, to 3D printing communities. Of course, the above groups are only a subset of people involved in 3D printing. Somewhere in between are people who buy 3D printers, and assemble and use the machines with the help of the community. They are commonly referred as 3) early adopters.

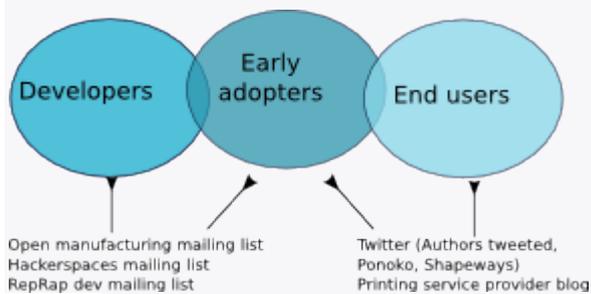


Figure 1. Target audiences and approach channels

The survey in 2013 was directed to all three groups (in Fig. 1 above). Developers were approached through developing mailing lists and hackerspaces discussion list. End users were approached with the help of a few 3D printing services and twitter. Shapeways, Ponoko, i.Materialise, Adafruit and Fabbaloo among others were asked to promote this survey and they all blogged and tweeted about it [imaterialise, shapeways, ponoko, fabbaloo, adafruit]. Early adopters were assumed to populate RepRap users mailing list and follow 3D printing related twitter feeds and blogs. Using twitter and getting publicity from 3D printing service providers most likely lead to some amount of ‘false respondents’ (the most extravagant answers were filtered out).

Time to take a look at the results.

Results

The amount of respondents was 344 (2012 count was 358), out of which 254 answered to all questions. 90 participants did not finish the survey for some reason. One of the reasons might be difficulties with the survey, a problem discussed at the end. Average respondent was a 35 years old male from Europe or North America.

Table 1. Basic statistics about survey participants (2012 in parenthesis).

BASIC STATS	
Participants	344 (358)
Male	263 (280)
Female	32 (24)
Mean age	34,7 (35,5)
Age range	13 - 74 (15 - 66)

Table 2. Geographical distribution of survey participants (2012 in parenthesis).

GEOGRAPHICAL DISTRIBUTION	
Europe	44,7% (50,3%)
North America	45,4% (37,7%)
Australia and Oseania	3,1% (8,3%)
Asia	5,2% (1,7%)
South America	1,4% (1,3%)
Africa	0,3% (0,7%)

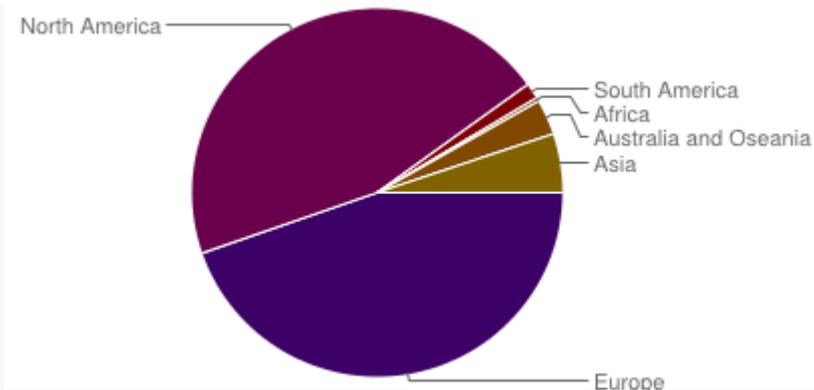


Figure 2. Geographical distribution (participants / continent).

No surprises here; the predominance of Europe and North America is to be expected, and is likely emphasised by the bias formed by the distribution of the call to the survey. No significant change compared to last year results.

Participants – a few characteristics

Gender

The majority of the participants were male 76,5% (last year 78,43%), while females represented a small minority 6,7% (6,72%). The rest 16,9% (14,85%) did not provide gender information.

Survey participant gender distribution

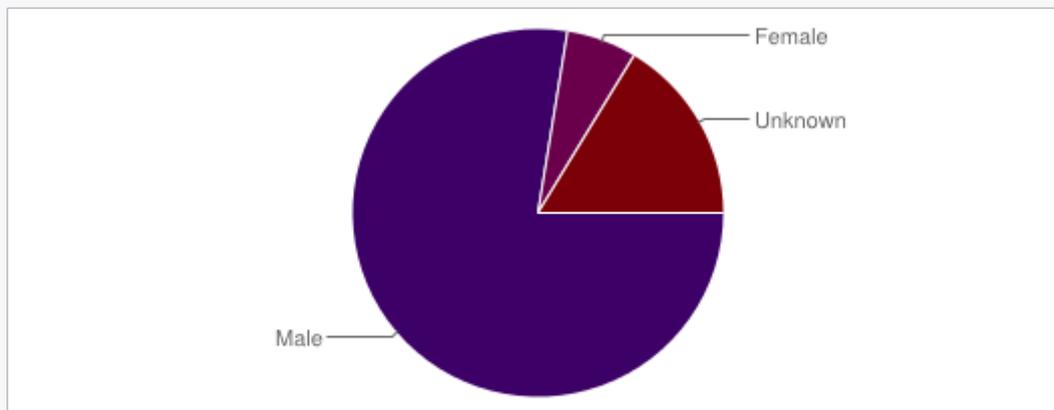


Figure 3. Survey participant gender distribution.

Age

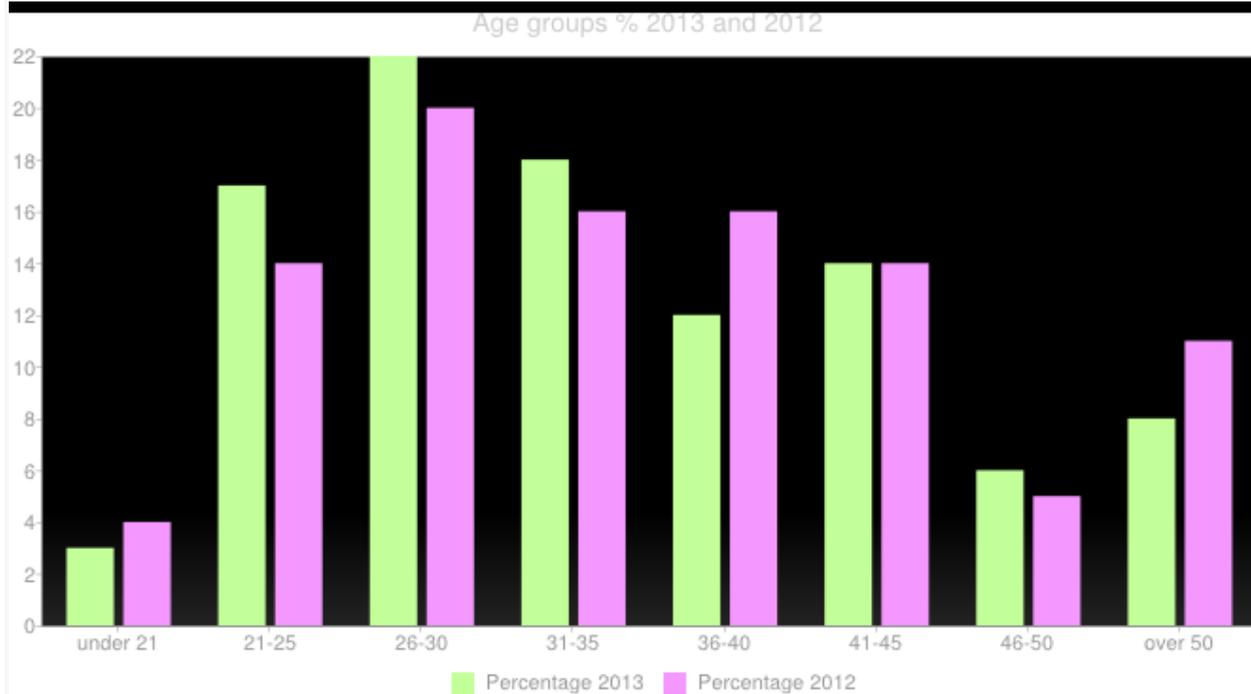


Figure 4. Age groups.

The basic demographics is male-dominated, as one would expect in a technology-oriented community. The mean age is somewhat higher than in (stereo)typical open source software communities [Mikkonen, Ghosh], again conforming well to the pattern where participants in open source hardware have been found to older than software hackers [Malinen].

Education

More Master Degrees than before. The percentage of 4-year college degree and Master's degree is 67%, last year it was 51%.

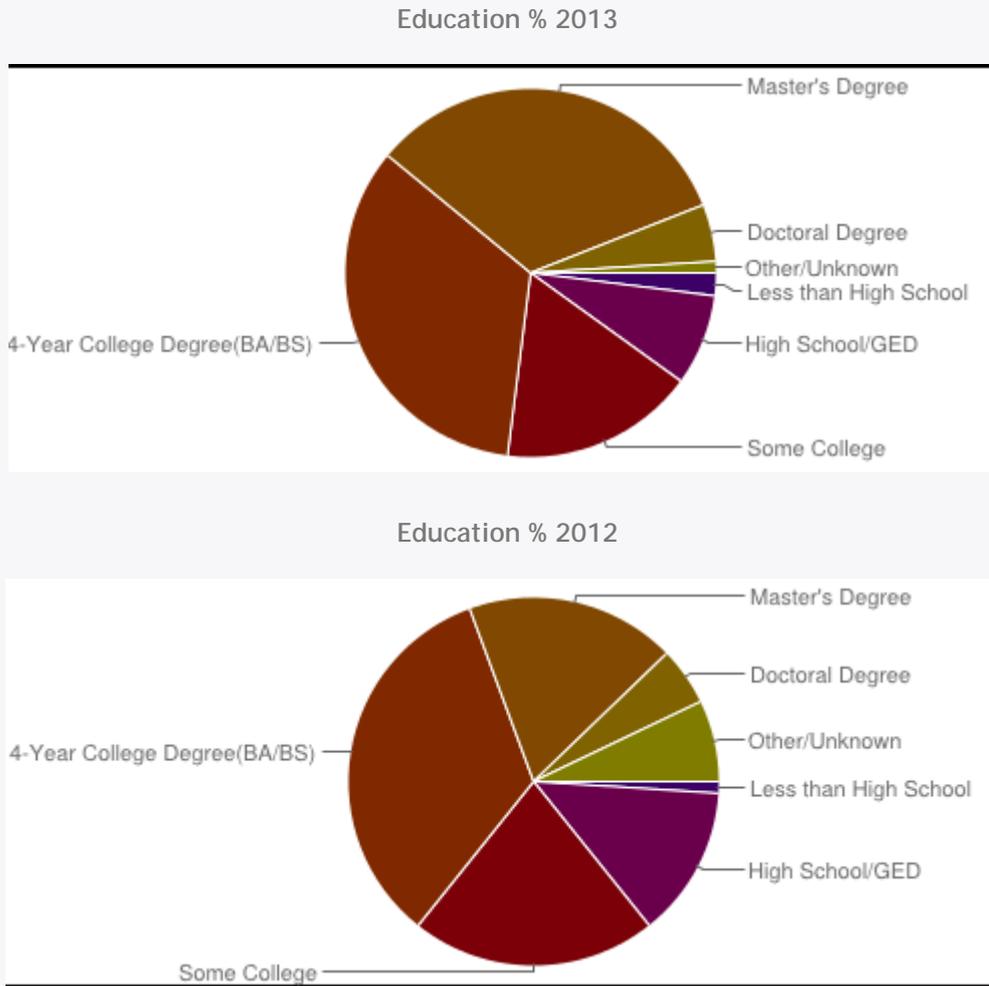


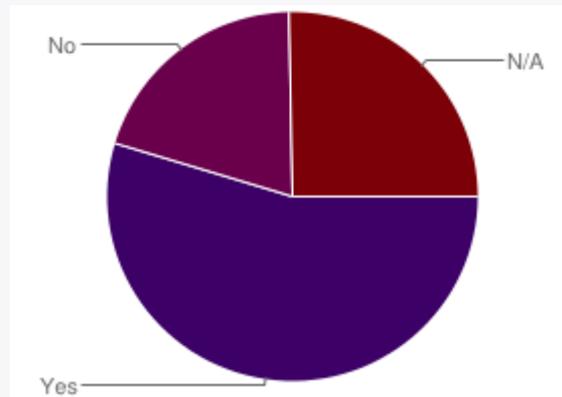
Figure 5. Education.

Last year the level of education of respondents was high, with 56% having at least a bachelor level degree. This year the figure is even higher, 67%. It will be interesting to see if this change is a part of a continuing trend towards higher levels of education. As discussed in the literature [Helander1, Helander2, Malinen], the higher educational background of the community may indicate a more "business-oriented" nature of the community, and its maturation from "hobbyism" towards "production-ready". However, such a trend and its importance is still a matter of speculation. In any case, as in terms of age, in terms of level of education, the 3D printing community is situated between typical software and typical hardware communities.

Identification to maker movement and peer production

Q: Do you consider yourself a member of the so-called maker movement?

2013 - Do you consider yourself a member of the so-called maker movement?



2013 - Do you consider yourself a member of the so-called maker movement?

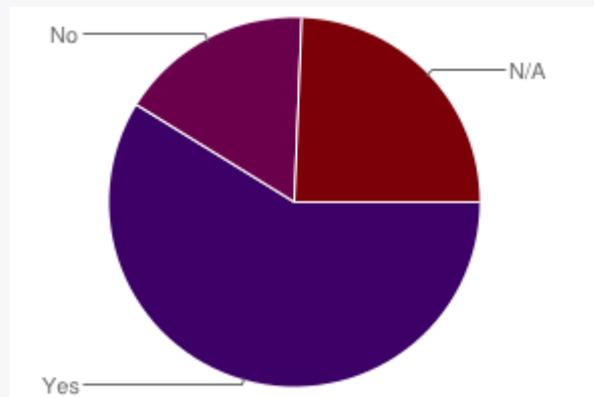
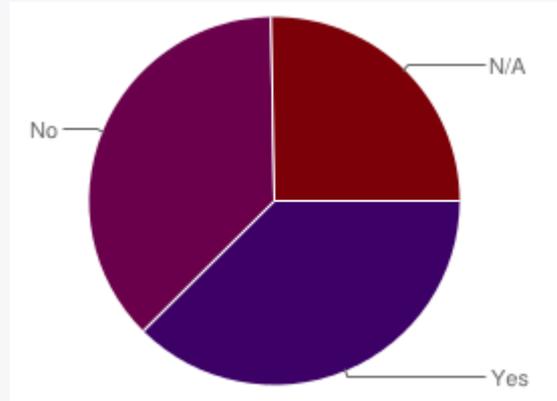


Figure 6. Do you consider yourself a member of the so-called maker movement?

Q:Do you consider your 3D activities a part of so-called peer production?

2013:Do you consider your 3D activities a part of so-called peer production?



2012:Do you consider your 3D activities a part of so-called peer production?

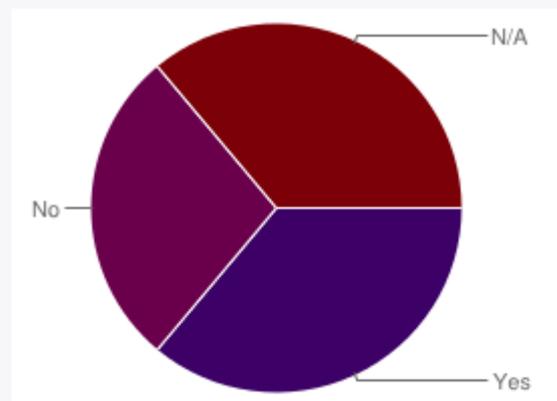


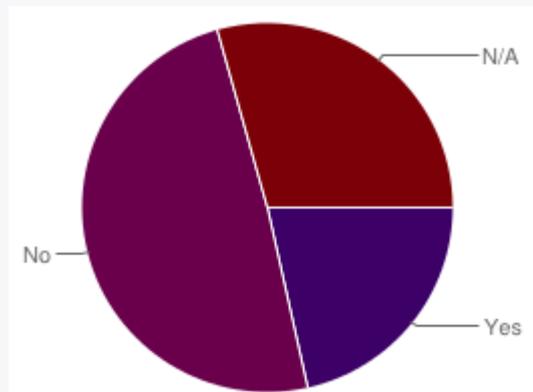
Figure 7. Do you consider your 3D activities a part of so-called peer production?

The respondents clearly identify more with the maker movement than with peer production. Especially the high number of "No" answers to the peer production question may indicate an aversion to the "ideological" nature of the term "peer production" in comparison to the more neutral "maker movement".

Membership in DIY communities

Q: Are you or have you been a member of a hackerspace, fab lab or a similar group?

2013: Are you or have you been a member of hackerspace, fab lab or similar group?



2012: Are you or have you been a member of hackerspace, fab lab or similar group?

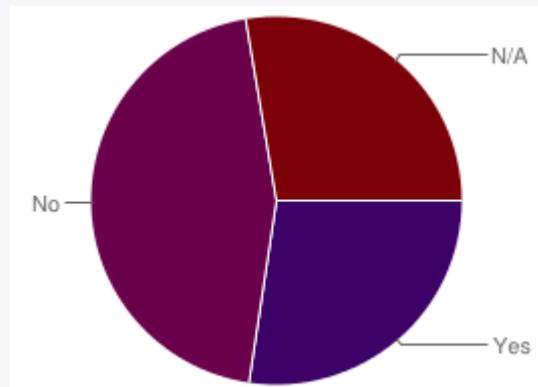


Figure 8. DIY community membership.

Again, it is interesting to see is the shift to a lower percentage of hackerspace membership is a sign of a continuing trend that could, for instance, signal that 3D printing is, in part, breaking out of the “geek” habitat towards a wider and more general community.

3D printing, manufacturing and development

Which year did you use 3D printing / printer the first time?

Survey participants were asked when they used 3D printer / printing services for the first time. Predefined options (years) were listed in a dropdown menu.

The amount of 3D Printers/Printing started rising around 2005-2006 and has been rising ever since. In the histogram below you can see the growth. The numbers for year 2012 seem to be dropping, but that is an artifice created by the polling schedule. This survey was conducted in middle of the year in May and therefore the amount for 2012 seems low. Likewise for 2013: the 2013 bar reflects only a part of the year.

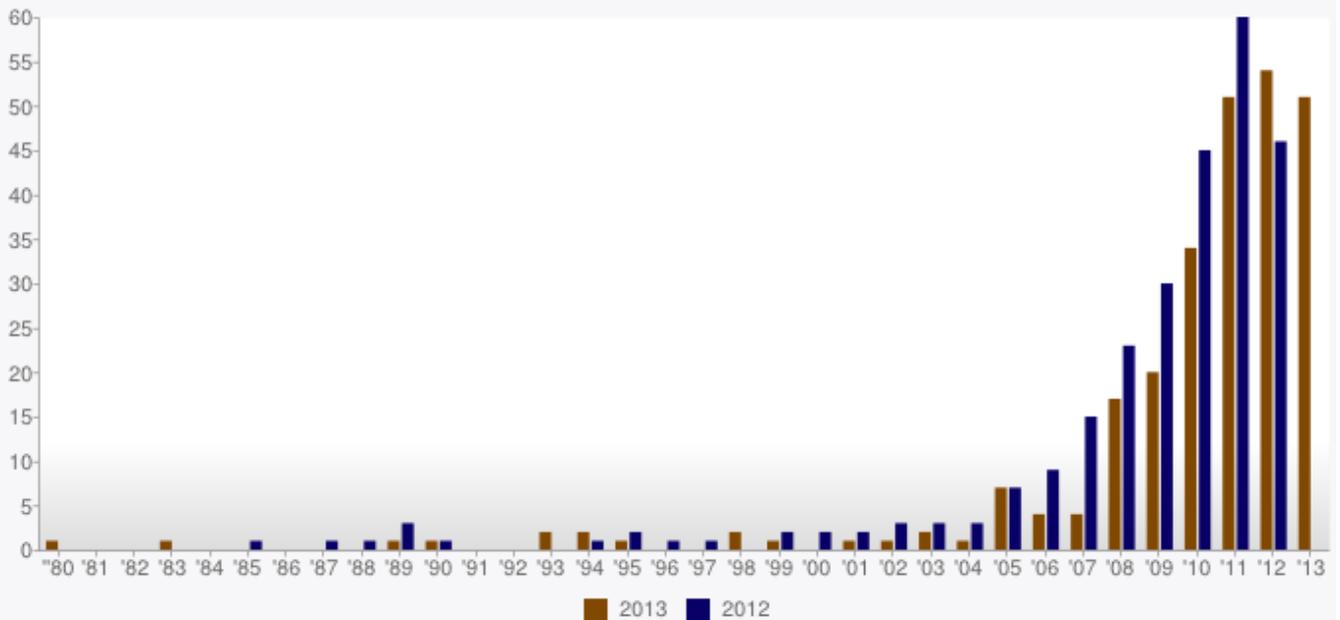


Figure 9. Which year did you use 3D printing / printer the first time?

The growth can be partly explained with the rise of RepRap. The first RepRap, "Darwin", was finished spring 2007 [RepRap]. Here the trend to watch is if the still clear growth (more first-timers every year) is starting to slow down.

For what usage do you use 3D printing?

Participants were asked "For what usage do you use 3D printing?" and given 10 predefined options together with a tick-box for 'other'. Predefined options were: Spare parts to devices, Covers and such for devices, Artistic items, Visual aids, Presentation models (including architectural models), Functional models, Used for pattern / in molds, For research/educational purposes, Direct part production (custom, short run, series production), Furniture and household decoration. The amount of selected items was not restricted.

Last year the results suggests that five most common usages for 3D printed items 2012 were:

1. Functional models (144 times),
2. Artistic items (140 times),
3. Spare parts to devices (133 times),
4. For research/educational purposes (128 times) and
5. Direct part production (113 times)

This year (2013) the order has changed:

1. Artistic items (165 times),
2. Functional models (136 times),
3. Spare parts to devices (131 times),
4. Direct part production (108 times) and
5. For research/educational purposes (100 times)

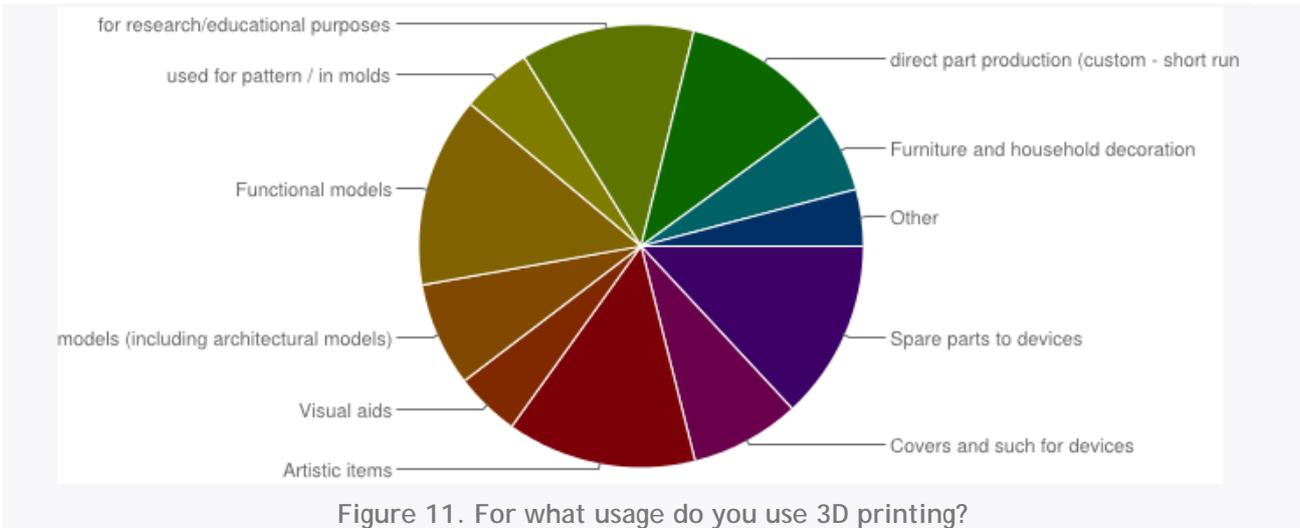
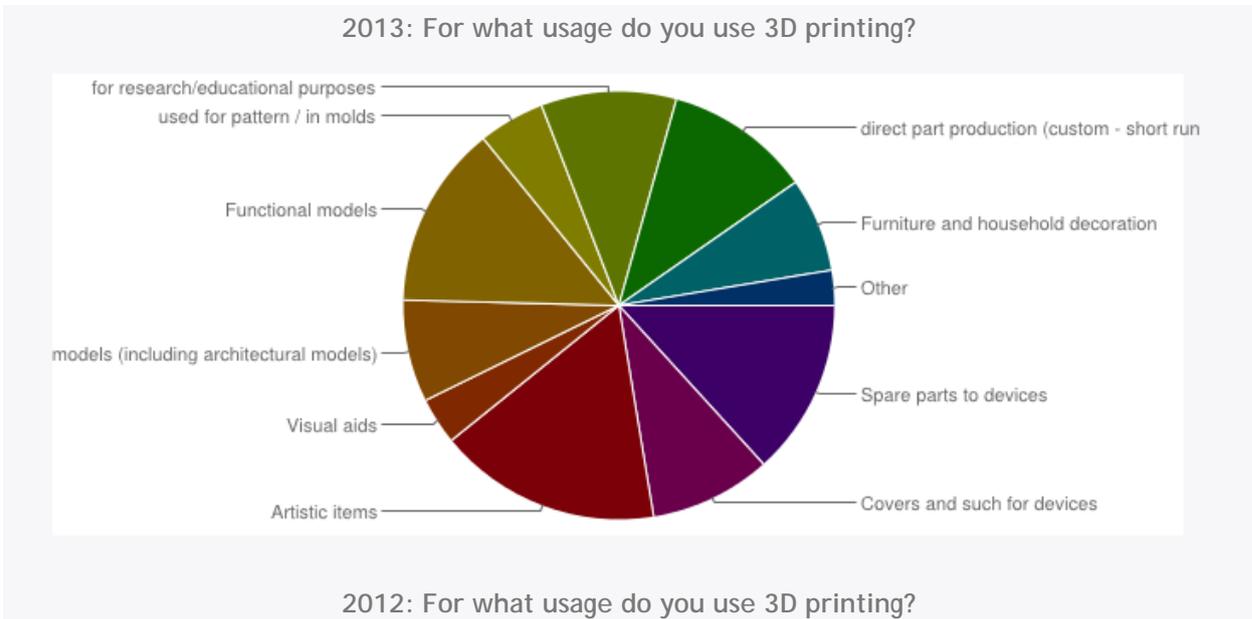


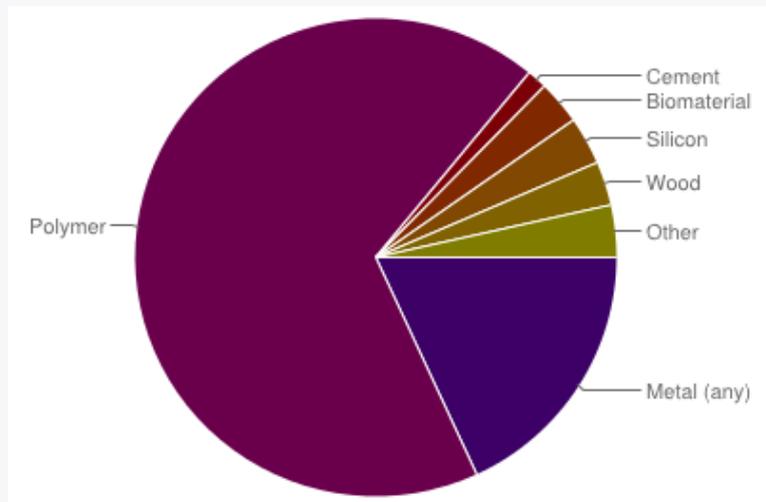
Figure 11. For what usage do you use 3D printing?

If participant selected 'other', it was instructed that a short description would be provided. Some of the survey participants (42) selected 'other', and provided descriptions containing items and usages such as toys, for fun, (custom) jewellery, reprints (replicating printer), prototyping, reselling, gaming miniatures, tools and medical devices.

Most common 3D printing material

Survey participants were asked "What kind of material do you use (now and in past) in printing?" and again they were given a predefined option set. In 2012 survey options were: Metal (any), Polymer, PLA, Cement, Biomaterial, Silicon, Wood, None, Other. In the 2013 survey PLA, Polymer and ABS were combined and given options were: Metal (any), Polymer, Cement, Biomaterial, Silicon, Wood, None, Other. The amount of selected items was not restricted.

2013: What kind of material do you use (now and in past) in printing?



2012: What kind of material do you use (now and in past) in printing?

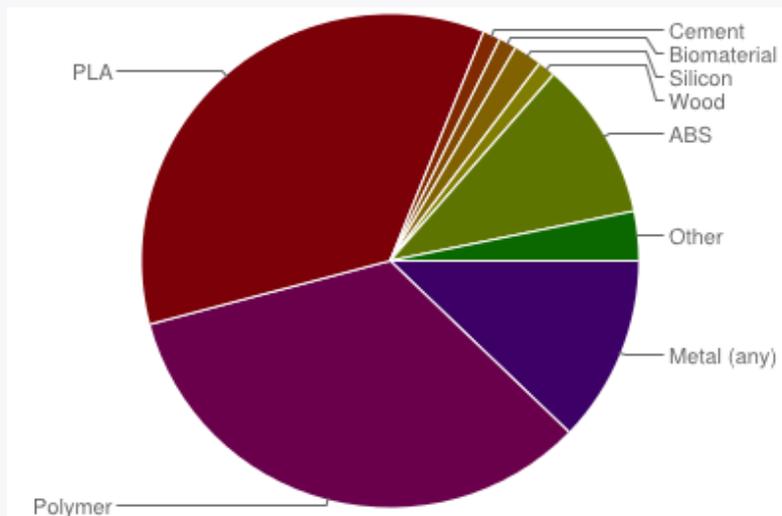


Figure 12. What kind of material do you use (now and in past) in printing?

Most commonly used 3D printers

Survey participants were asked "Which printers (which manufacturer) have you used?" and again they were given a predefined option set. Options contained 20 different manufacturers. Three options (Arcam, Blue Printer and Solidoodle) did not get any answers and have been left out of the charts, below. A few manufacturers were selected only by a few participants (1-6 times). Such companies were: Botmill, ExOne, Fortus, Makibot, and Solidscape & Envision Tec. Those were also left out of the chart. Thus, the pie chart below depicts the most commonly used 3D printer manufacturers.

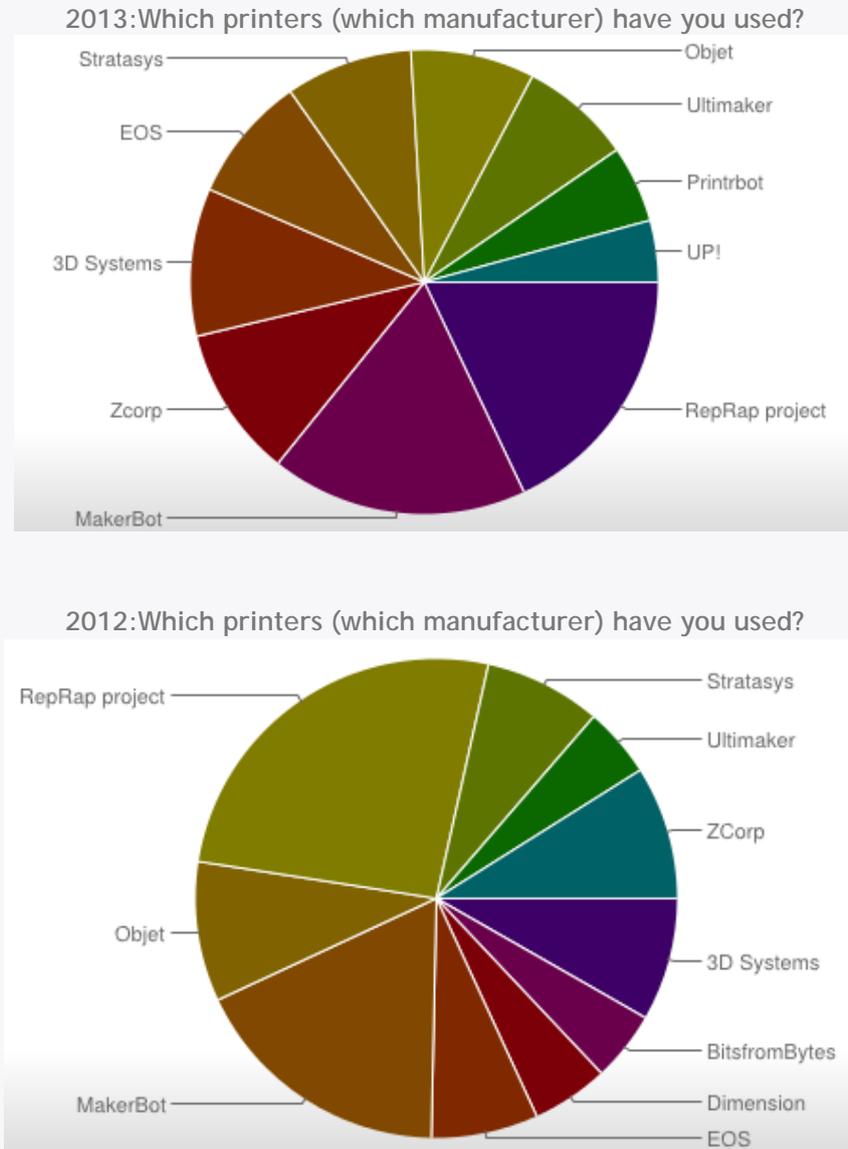


Figure 13. Which printers (which manufacturer) have you used?

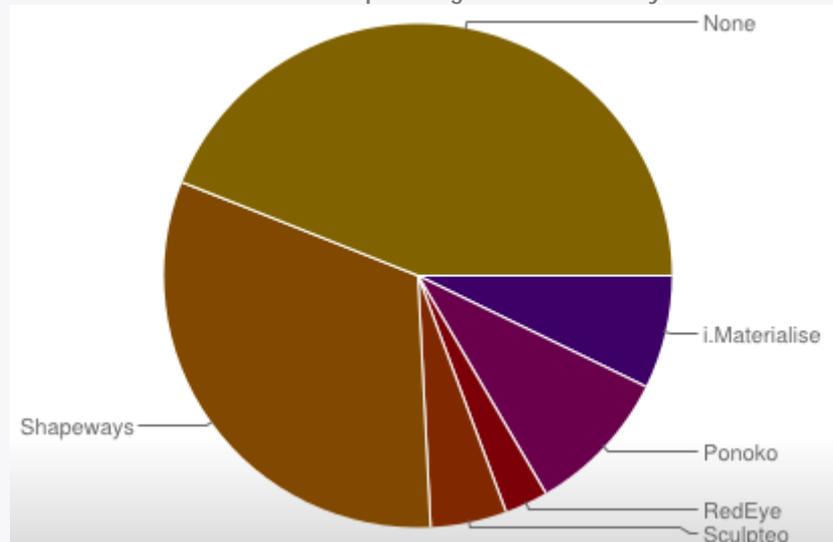
2012: RepRap was the most common printer among the participants. RepRap is also the first printer (of the listed 'new wave' printers) that was available (since 2007). The relatively low amount of Makerbots can partly be explained with long market entry time, since Makerbot has been around since early 2009. Some of the printers have just entered or are entering the markets, such as printrbot.

2013: The variety of 3D printers used has become wide. More than 20 different names were mentioned, but in the below chart we have selected 10 most mentioned printers/printer manufacturers. RepRap Project (84 times) still holds the pole position, but Makerbot (83 times) is practically as common.

3D printing services

The participants were asked: "Which of the 3D printing services have you used?" Again, question contained predefined options: 3D Creation Lab, 3dprintuk, 3DProParts, Cubify Cloud Print, i.Materialise, Impression-3D, Kraftwurx.com, Ponoko, RedEye, Sculpteo, Shapeways, Solid Concepts, None, Other. If participant selected 'other', it was instructed that description would be provided.

2012: Which of the 3D printing services have you used?



2013: Which of the 3D printing services have you used?

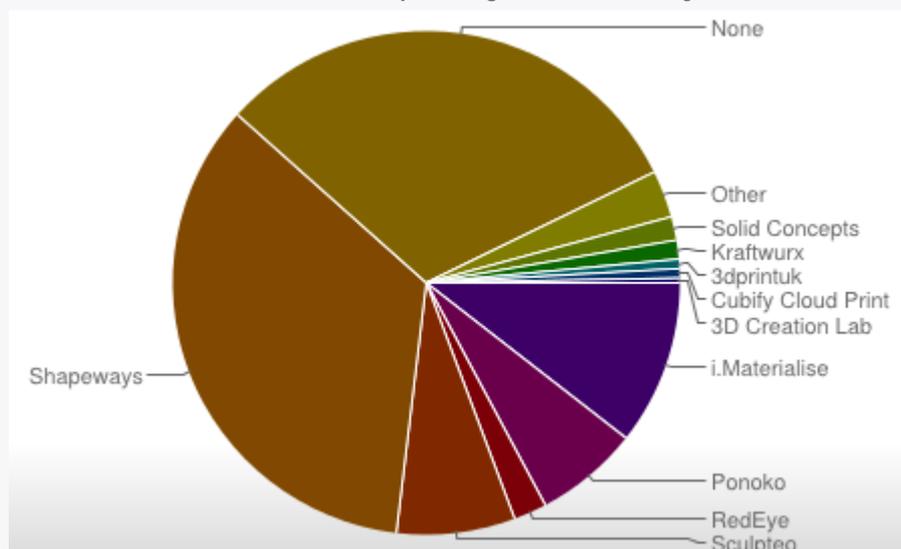


Figure 14. Which of the 3D printing services have you used?

2013: Shapeways is still most used 3D printing service. i.Materialise has taken the second position, which might correlate with the rise of 'artistic' 3D prints.

Motivation

Q: "What do you think of the following claims?"

2013: What do you think of the following cl:

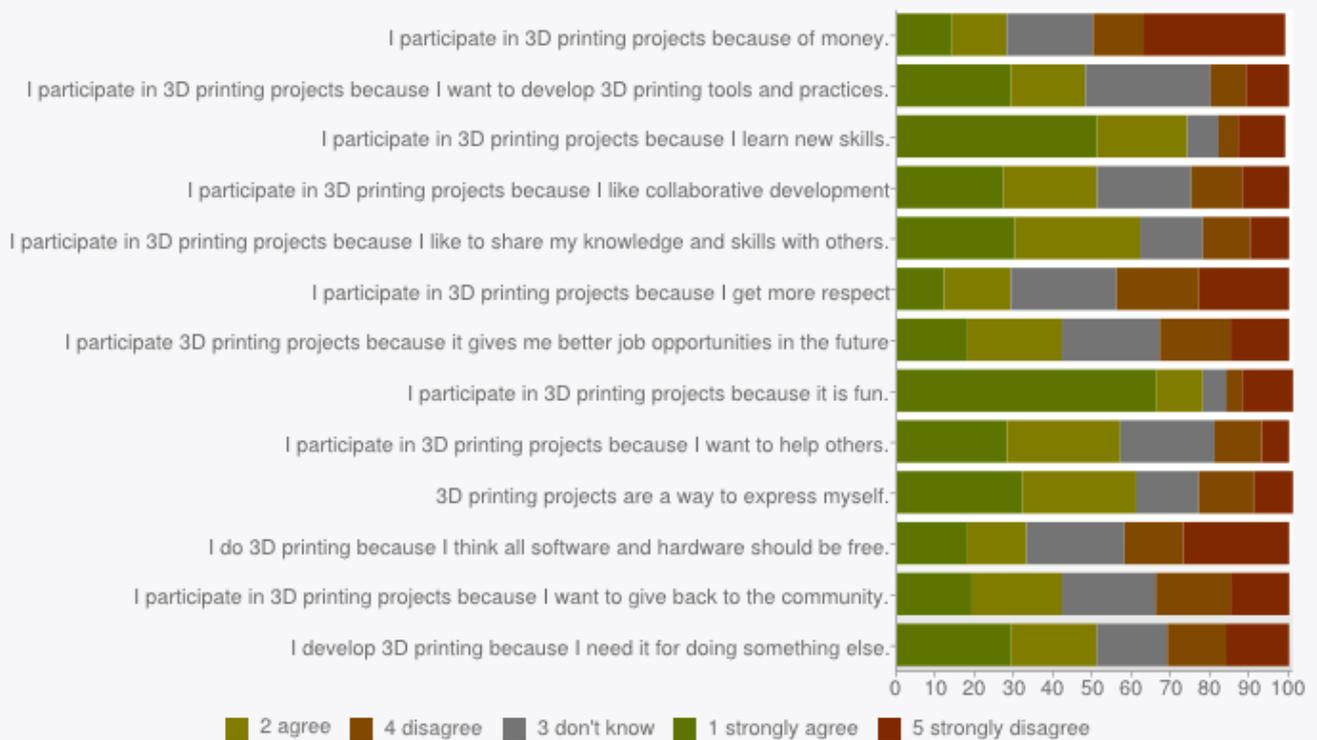


Figure 15. Motivation to use 3D printing services.

This was a new question in the 2013 survey. The two clearly most prominent factors are "fun" and "learning new skills", followed by the urge to share and for personal expression. These, as well as the strong component of disagreement to "because of money", seem to suggest both "knowledge-enriching" and "group-enriching" motivations (in the classification by [Aalbers], see also [Mikkonen]). One striking result is the low percentage of respondents agreeing with the motivation "because I get more respect". In general, the presence of this motivation indicates a more or less self-aware community, so it seems that the 3D community is somewhat more dispersed than typical open source software communities - but this needs more analysis. Maybe it also indicates that the community does not, at least yet, provide a recruiting channel for talented participants, like many open source software communities do.

Q: "Following claims concern your motivation to use 3D printing services. "

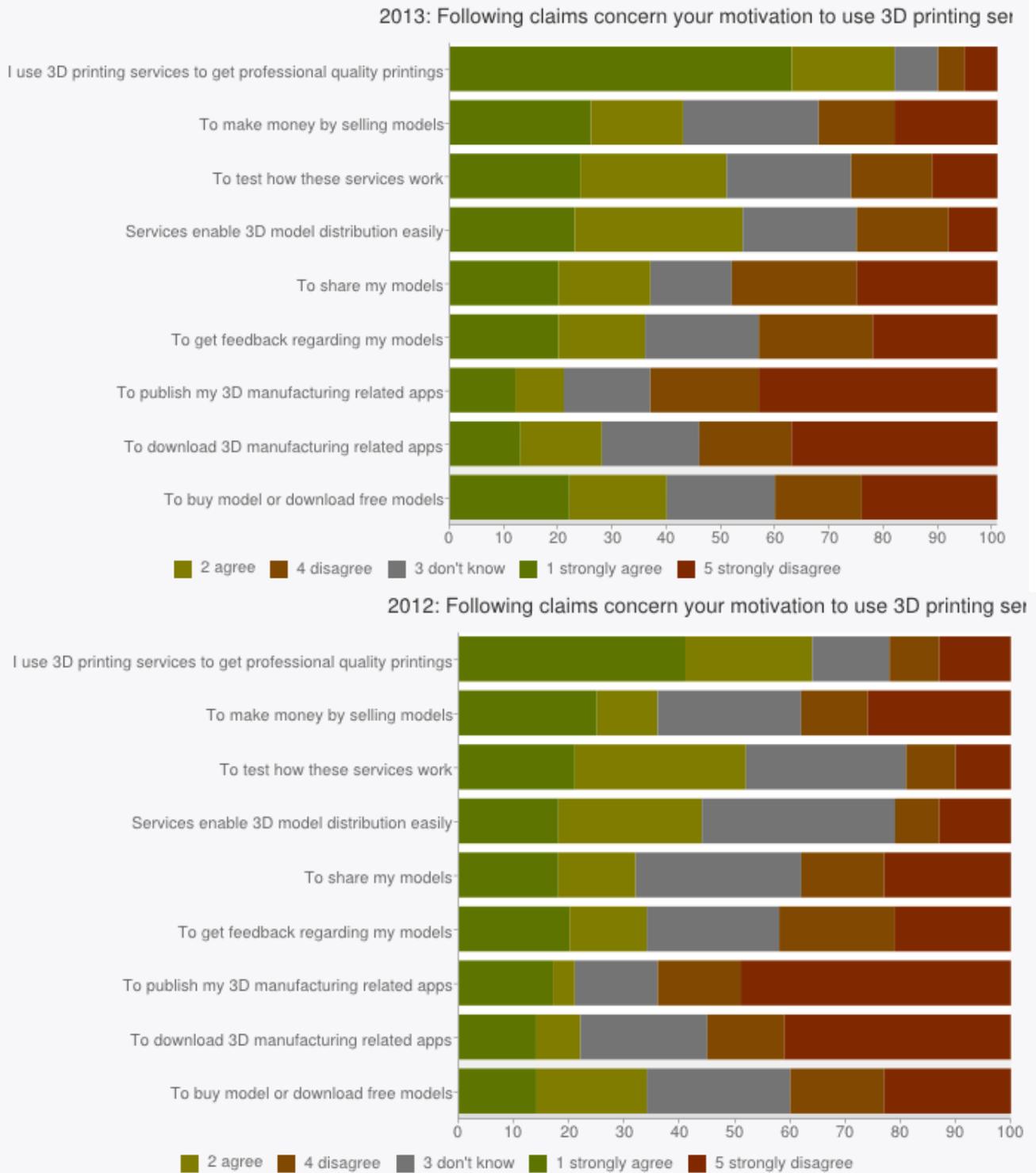


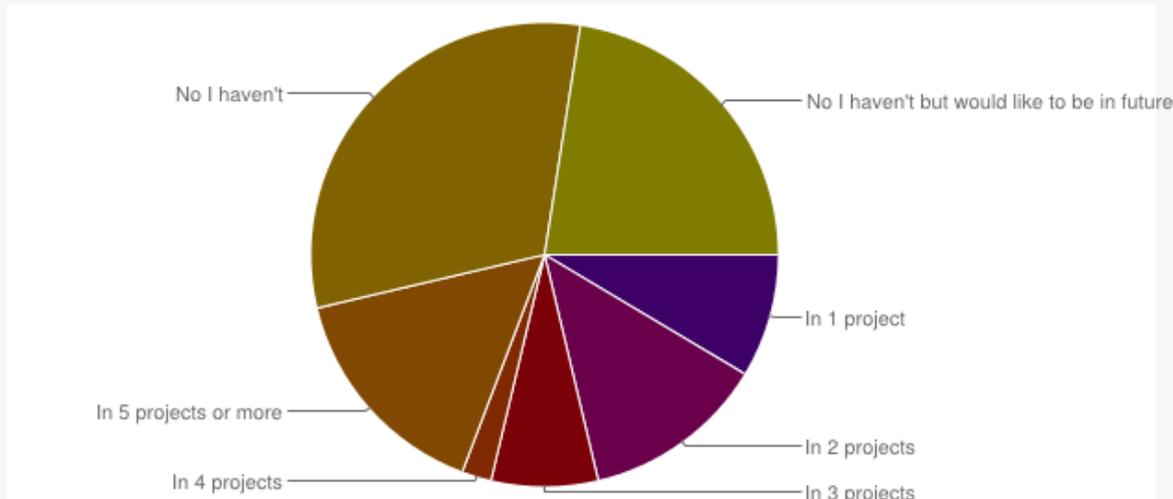
Figure 15. Motivation to use 3D printing services.

3D Printing service are more clearly used to get quality prints. This is a clear signal for 3D printer manufacturers (and developers) to increase printout quality.

Open source or not?

Q: "Have you been involved in free/open source software projects? If so in how many?"

2013: Have you been involved in free/open source software projects? If so in how many?



2012: Have you been involved in free/open source software projects? If so in how many?

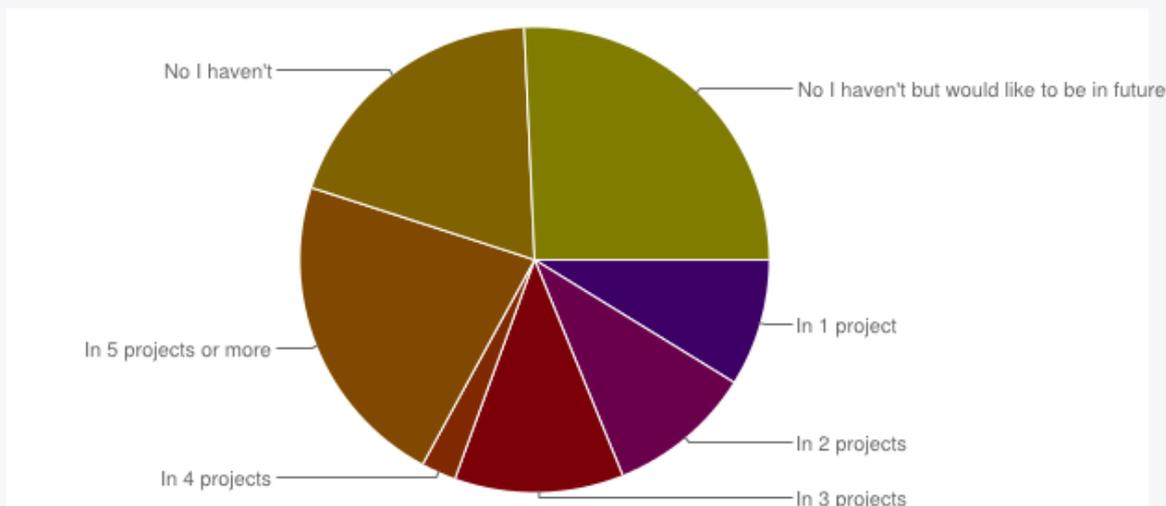


Figure 16. Survey participants involvement in open source projects.

2012: 55% of the participants were involved at least in one open source project. Nearly 20% wanted to be involved in the future. Roughly 26% did not want to be involved in open source project.

2013: 46% of the participants were involved at least in one open source project. Nearly 23% wanted to be involved in the future. Roughly 31% did not want to be involved in open source project.

To us, these numbers suggest that 3D printing can be seen partly as a continuation of open source. Over half of respondents have previous experience of the open source "modus operandi", and bring their knowledge to the printing community. The explicit open source affiliation of the RepRap community - RepRap being the most used printer model - is one obvious source of the connection.

On the other hand, there are other roots for the community and participants. For instance, the amount of 3D printing done for artistic purposes (2012: the second most common usage, 2013: the most common) is noteworthy. It would be interesting to know how many of the respondents have a background and motivation in a more hands-on attitude of doing concrete things rather than in "fiddling with software and computers". The identification with the maker movement may in part indicate this tendency.

Licenses used

This was a new question in the 2013 survey. Participants were asked about licenses used in both software and hardware development.

Software

Q: "If you develop 3D printing related software, which license do you prefer for your own code?"
"Respondents were given predefined options including "other".

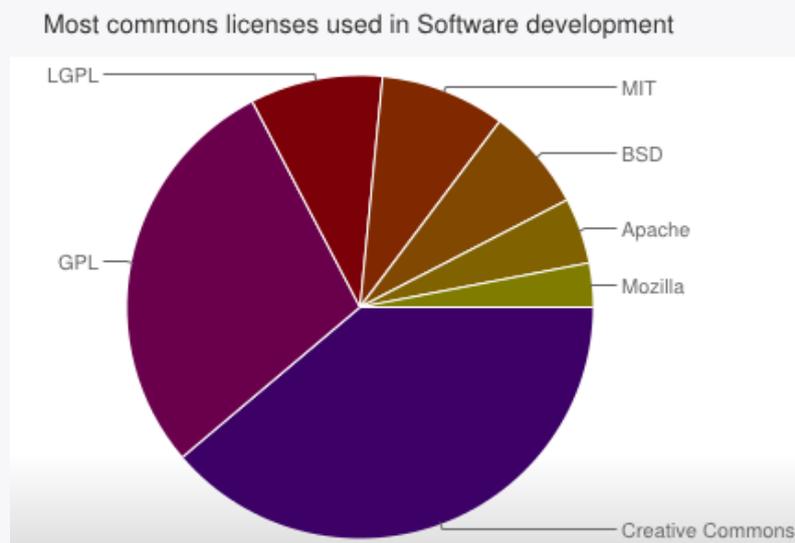


Figure 17. Preferred licenses among survey participants in software development.

Hardware

Q: "If you develop 3D printing related _hardware_, which license do you prefer for your own code?"

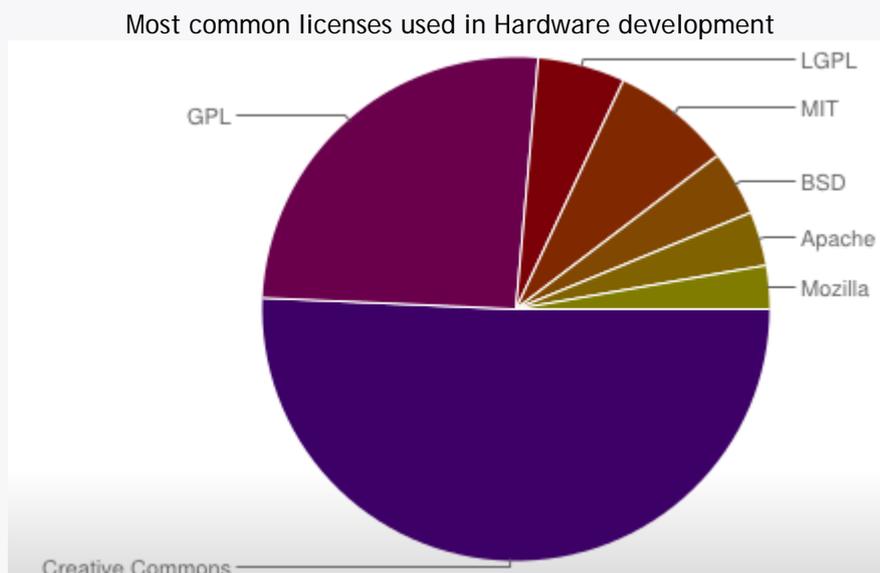


Figure 18. Preferred licenses among survey participants in hardware development.

To us wide usage of Commons Licenses indicates that hardware development lacks 'proper' license.

Future

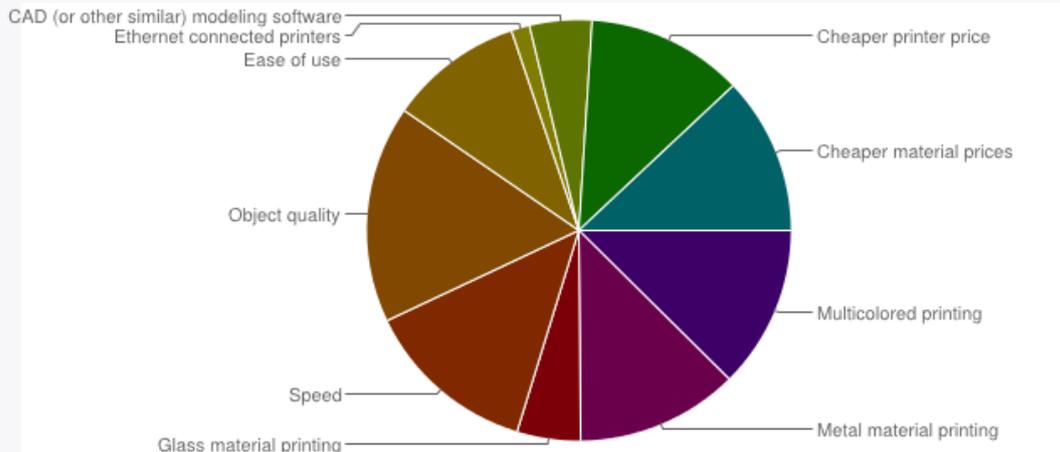
Most wanted feature

Participants were asked “What is the most wanted feature you are waiting for to develop further or to emerge?” and given predefined list of options: Multicolored printing, Metal material printing, Glass material printing, Speed, Object quality, Ease of use, Ethernet connected printers, Better printer integration to CAD (or other similar) modeling software, Cheaper printer price, Cheaper material prices, Other. Year 2012 is in parenthesis.

Of the given options:

1. Object quality: 155 (166),
2. Speed: 123 (119),
3. Multicolored printing 116 (88)
4. Metal material printing: 115 (108)
5. Cheaper material prices: 112 (115),
6. Cheaper printer price: 111 (106) were most common.

2013: What is the most wanted feature you are waiting for to develop further or to emerge?



2012: What is the most wanted feature you are waiting for to develop further or to emerge?

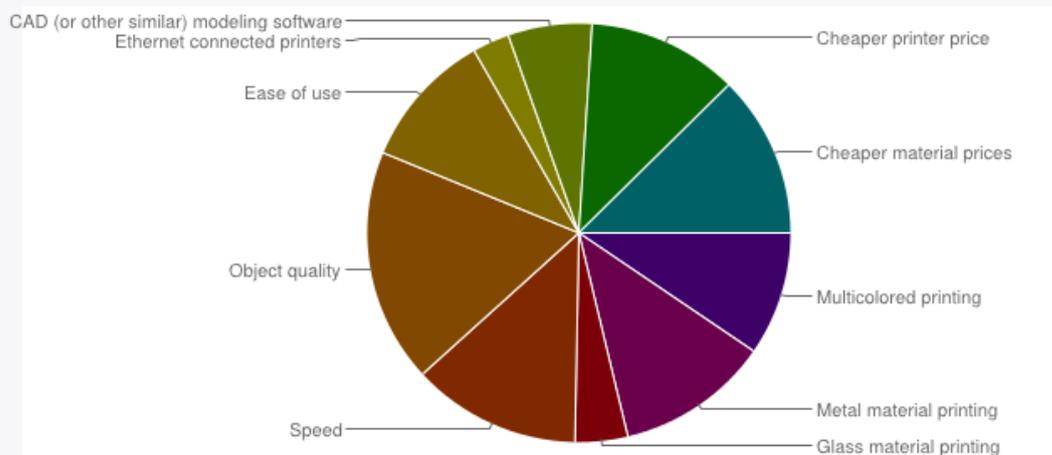


Figure 19. Most wanted features.

Bottlenecks

Survey participants were asked what they see as the bottlenecks in development and in general in 3D printing: “What, in your opinion, is the greatest bottleneck for the development in 3D technology right now? - printers - materials - designs - social co-operation - internet infrastructure - other infrastructure”. Answers were given as free text. Answers were classified to groups by hand. The amount of answers was 209, from which a wide range of topics was found.

In a nutshell: participants brought up several bottlenecks out of which most were tangled around following topics:

- design process related (software and models),
- hardware related (printers and configuration),
- production related (lack of speed, lack of materials, high costs) and
- business model related (patents, polarization and difficulties in startups).

A lot has been written about 3D printing during the past few years and 3D printing has gained even some screen time in TV shows. Some claim that media has focused on irrelevant features and even created false expectations also known as hype. One respondent argues that too great expectations might do more damage than we even understand and “this will lead to a crash (like AI, VR, satellite phones)”. Another respondent said that there’s “not enough practical applications for a wider audience”, which most likely does not help in getting masses familiar with 3D printing and the possibilities it contains.

Design process

Software bottlenecks identified by the participants contained two views: designer/creation tool view and printer management view. Lack of easy to use 3D design applications are still seen as one of the biggest bottlenecks as one respondent puts it: “in practical terms, the weakness of development of 3D technology is the 3D software.” At this front, improvements seem to have been minimal. Design applications “are still clunky for most everyday users.” Lack of tools suitable for ‘average Joe and Jane’ most likely hinder development of high quality 3D printable models. This in turn leads to situation where masses “are stuck on download things.” Lack of good 3D model management platform is most likely also causing headache. Of course there’s Thingiverse.com which can be seen more as end-user oriented solution, but even Thingiverse.com isn’t so much about sharing as people tend to think. Nearly half of the models are private.

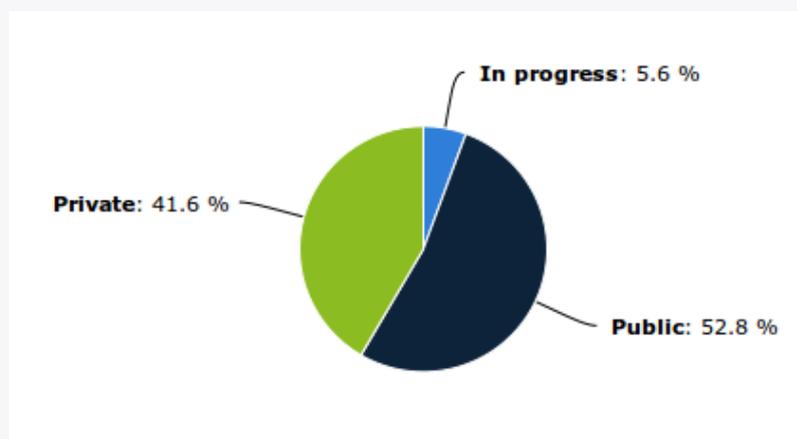


Figure 20: In august 2013, out of 117 450 ‘things’ analyzed in Thingiverse.com, nearly 42% are private. Source: <http://ossoil.com/thingiverse/>

So, end-users have a place to look for printable 3D models, but 3D model designers don't have easy to use collaboration management platform. Some niche solutions exist, such as 'githubiverse' and cubehero.com. Githubiverse is based on Github and offers a template to display 3D model information in github repositories. Neither githubiverse or cubehero.com seem to be popular. Their impact, if any, on digital 3D model sharing remains to be seen. Perhaps Thingiverse.com is partly used as 'design development' platform and therefore a big chunk of the 3D models are private. So, what options do we have to get more printable high quality digital 3D models?

Participants offered two alternative routes or methods to get more 3D models into use. First suggestion was scanning, which is emerging already, but is still rather cumbersome to use. Wider usage of 3D scanning would without doubt increase the amount of 3d models available. However, the quality of printable 3D models, which seems quite important for the community, would remain to be seen. Current 3D scanning methods can produce digital 3D models quickly, but hardly 'out-of-the-box' 3d printable solutions. Some manual labor is still needed to gain needed high quality ready-to-print digital 3D models. The other suggested method requires new paradigm in design and perhaps longer time to emerge. Since current CAD tools have rather steep learning curves and are seen "still clunky for most everyday users...too complex/expensive for most users", the alternative is to change the modeling process to something more natural and apply new interfaces: "need a consumer-ready interface for creating 3d models (think leap-motion/kinect integration)". The idea could be taken a step further and include 3D view goggles. A good starting point could be to extend Elon Musk's design practices and tool chains [Musk]. All the above could offer what the community is after: "easy 3D software for the masses".

Yet another lack identified by the respondents is "ability to model the printing process within design software, to simulate strength, compliance, fits, etc". Some of the commercial CAD platforms offer such tools although not 3D printing focused, but equivalent open source solutions do not exist.

Hardware related

Printing speed and reliability were the second most common issue mentioned by the respondents. Current 3D printers and services alike suffer from lack of speed. Time to print a part is too long and it takes weeks to get ordered 3D prints from services. Also the low reliability is visible in high amount of failed prints or as need to babysit a 3D printer. One responded argued that "the current focus on FDM, because it is affordable" is the biggest bottleneck. In respondents opinion "FDM is a toy, not a tool!" Also hardware calibration, especially multi-extruder, was seen too difficult at the moment. Markets are flooding with new 3D printer manufacturers who might market their product with misleading arguments or as one respondent puts it "low-cost printers not being as plug and play as they claim".

Production related

The need for multiprinter management was brought up a few times: "No way to control 1-50 machines through one 'command and control' machine used for queuing up of said printed object." This problem refers to the need to network manufacturing units and to build 3D printing farms and networks. Such networked solutions are emerging and one example is 3Dhubs.com. 3Dhubs is a 3d printing network, which is based on the belief that "everyone should have easy access to 3D Printing. We do this by connecting people who want to print to the people owning the machines." In development and production, tool chains are critical, must be simple and fluent. Yet in 3D printing according to one respondent "the tool chain beyond design is also crap - with a few exceptions - since everyone is trying to solve only one piece

of the workflow." This might refer to situation where businesses and communities around 3D printing are work as islands instead of relying on collaboration. Sharing development costs and other resources by forming larger coalitions might offer a tool to build shared roadmap for development and integration. One respondent mentioned the lack of sufficient documentation (community and vendors), which also makes integration harder and results in broken or cumbersome tool chains.

Material related issues were the most common topic among the respondents. Most of the low-cost 3D printers use polymers such as PLA and ABS as material, but lack of "multi-materials printing" and "more soft and flexible materials" are material-wise the biggest bottlenecks of 3D printing. Also lack of "printers capable of printing fine detailed models in various metals (at a good price)" was seen as a huge disadvantage. Some 3D printing companies offer metal 3D printing, but according to one respondent metal 3d printing is "too expensive from all services". New materials arise and we are not limited to just ABS and PLA, but "bad quality with new materials" was mentioned. The same respondent also suggested that "materials should focus more on physical qualities and not the color/looks."

Business model related

This year respondents brought up new aspects in the business related bottlenecks. Again, this might indicate that 3D printing ecosystem is maturing as was discussed earlier with rising amount of academics. Three intertwined viewpoints were offered by the participants: patents multinational corporations and startups. Patent related issues were mentioned last year as well. Respondents still consider "patents held by monster corporations" as a bottleneck for 3D printing ecosystem to develop faster and become more vibrant. The patent situation is expected to change 2014 and community seems to be eagerly waiting for it: "especially when certain patents expire an open the door to many small companies entering the market with their own ideas for improvement".

The competition in 3D printing is getting tougher. This has lead to situations where "Stratasys and 3D Systems are buying up all the innovative start ups". The role of "monster" companies in 3D printer technology is mostly seen as negative among the participants: "economic interests from the big players", "They prevent the development of opened projects by monopolizing the market." If the markets continue to polarize the possibility of having long-term "projects like RepRap will struggle to emerge because they will be done by industries" even before the community has had the time to develop. Respondents did not however put all the blaim on multinational corporations. As it was discussed before, more and more 3D printer manufacturers have emerged, some via kickstarter. According to one respondent new printer manufacturers have "extremely poor management...seems to be very rare for a printer manufacturer to be able to manage and grow their own business successfully." As it was mentioned above, the role and economic interests of multinational corporations and difficulties in scaling up startups might be interlinked.

Interestingly, business related issues brought up by the participants were all related to 3D printer manufacturers and 3D printing services were not discussed at all.

Discussion

3D printing as a technology and the 3d printing community is still in its early days. The amount of people involved is growing; both the 2012 and the 2013 surveys indicate that the number of “beginners” greatly overshadows the number of “old-timers”. This means that even relatively big changes in the composition of the community are possible, if not likely. Interestingly, compared to 2012, in 2013 we see an increase both in the number of different printers and printing services used. This seems to signal a period of increased interest and innovation. There are also smaller shifts in the replies to the question on most wanted feature and what kind of objects are printed. It will be very exciting to see how these trends develop in the future. In our view, the increased use and the proliferation of different services and community platforms also means that the importance of easy and comprehensible licensing practices and models will grow in the near future.

Future research

The usage of 3D printing services has spread among multiple companies. Interesting questions are which are the factors for selecting 3D printing service? Materials available? Geographical location; is nearest preferred? Is the selection based on some other criteria? The amount of academics in 3D printing community is rising. Could the percentage of academics be used as an indicator of community maturity? Does the amount of academics correlate with the rising need for software development? Some similar thoughts and questions can be found from https://fossbazaar.org/system/files/OSSI_Final_Report_-_Open_Source_Software_Management_Framework.pdf). Nevertheless, the amount of academics in 3D printing community is now in the middle compared to ‘pure’ hardware and ‘pure’ software development communities. Another interesting phenomenon to follow is the amount of kickstarted driven development in 3D printing. The rising importance of kickstarter driven development was visible already this year: among the top 10 3D printers Printbot was included and 2 others (Form1 and PrintXel) were mentioned a few times. Survey raw data is available for further analysis <http://surveys.peerproduction.net/open-data/longitudinal-survey-data/#3d-manufacturing-community-surveys>

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