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Maker Market Study:

An In-depth Profile of Makers at the Forefront of Hardware Innovation

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MAKE/Intel Maker Market Study:

An In-depth Profile of Makers at the Forefront of Hardware Innovation

MAKE's Hardware Innovation Workshop presents a unique opportunity to explore the trends shaping innovations by and for makers. Our goal is to provide a "big picture" understanding of how new technology and new communities are changing product development, collaborative design, and manufacturing.

More and more, makers are thinking "big," focusing their making on broader-based needs, from improving consumer products that might hit the mass market, to designing medical devices that might fill an industry niche. As a result, increasingly, businesses and investors are paying attention to makers and asking what role they might play in their success.

So, we undertook this joint research project with Intel to provide in-depth knowledge about the maker community, their collaborative approach to making, and their use of tools and technology. What's more, this research can also shed light on the attitudes and behaviors of makers.

We appreciate Intel's support—in addition to being our partner in this research, they are also sponsoring activities at Maker Faire including Education Day and becoming a founding partner in the Maker Education Initiative.

We look forward to your comments and feedback and hope to share more of this data with you over the coming months.

Best regards,

Dale Dougherty

A Third Industrial Revolution

by Paul Markillie

Reprinted with permission from The Economist, 4/21/12

OUTSIDE THE SPRAWLING Frankfurt Messe, home of innumerable German trade fairs, stands the "Hammering Man", a 21-metre kinetic statue that steadily raises and lowers its arm to bash a piece of metal with a hammer. Jonathan Borofsky, the artist who built it, says it is a celebration of the worker using his mind and hands to create the world we live in. That is a familiar story. But now the tools are changing in a number of remarkable ways that will transform the future of manufacturing.

One of those big trade fairs held in Frankfurt is EuroMold, which shows machines for making prototypes of products, the tools needed to put those things into production and all manner of other manufacturing kit. Old-school engineers worked with lathes, drills, stamping presses and moulding machines. These still exist, but EuroMold exhibits no oily machinery tended by men in overalls. Hall after hall is full of squeaky-clean American, Asian and European machine tools, all highly automated. Most of their operators, men and women, sit in front of computer screens. Nowhere will you find a hammer.

And at the most recent EuroMold fair, last November, another group of machines was on display: three-dimensional (3D) printers. Instead of bashing, bending and cutting material the way it always has been, 3D printers build things by depositing material, layer by layer. That is why the process is more properly described as additive manufacturing. An American firm, 3D Systems, used one of its 3D printers to print a hammer for your correspondent, complete with a natty wood-effect handle and a metallised head.

This is what manufacturing will be like in the future. Ask a factory today to make you a single hammer to your own design and you will be presented with a bill for thousands of dollars. The makers would have to produce a mould, cast the head, machine it to a suitable finish, turn a wooden handle and then assemble the parts. To do that for one hammer would be prohibitively expensive. If you are producing thousands of hammers, each one of them will be much cheaper, thanks to economies of scale. For a 3D printer, though, economies of scale matter much less. Its software can be endlessly tweaked and it can make just about anything. The cost of setting up the machine is the same whether it makes one thing or as many things as can fit inside the machine; like a two-dimensional office printer that pushes out one letter or many different ones until the ink cartridge and paper need replacing, it will keep going, at about the same cost for each item.

Additive manufacturing is not yet good enough to make a car or an iPhone, but it is already being used to make specialist parts for cars and customised covers for iPhones. Although it is still a relatively young technology, most people probably already own something that was made with the help of a 3D printer. It might be a pair of shoes, printed in solid form as a design prototype before being produced in bulk. It could be a hearing aid, individually tailored to the shape of the user's ear. Or it could be a piece of jewellery, cast from a mould made by a 3D printer or produced directly using a growing number of printable materials.

But additive manufacturing is only one of a number of breakthroughs leading to the factory of the future, and conventional production equipment is becoming smarter and more flexible, too. Volkswagen has a new production strategy called Modularer Querbaukasten, or MQB. By standardising the parameters of certain components, such as the mounting points of engines, the German carmaker hopes to be able to produce all its models on the same production line. The process is being introduced this year, but will gather pace as new models are launched over the next decade. Eventually it should allow its factories in America, Europe and China to produce locally whatever vehicle each market requires.

They don't make them like that any more

Factories are becoming vastly more efficient, thanks to automated milling machines that can swap their own tools, cut in multiple directions and "feel" if something is going wrong, together with robots equipped with vision and other sensing systems. Nissan's British factory in Sunderland, opened in 1986, is now one of the most productive in Europe. In 1999 it built 271,157 cars with 4,594 people. Last year it made 480,485 vehicles—more than any other car factory in Britain, ever—with just 5,462 people.

"You can't make some of this modern stuff using old manual tools," says Colin Smith, director of engineering and technology for Rolls-Royce, a British company that makes jet engines and other power systems. "The days of huge factories full of lots of people are not there any more."

As the number of people directly employed in making things declines, the cost of labour as a proportion of the total cost of production will diminish too. This will encourage makers to move some of the work back to rich countries, not least because new manufacturing techniques make it cheaper and faster to respond to changing local tastes.

The materials being used to make things are changing as well. Carbon-fibre composites, for instance, are replacing steel and aluminium in products ranging from mountain bikes to airliners. And sometimes it will not be machines doing the making, but micro-organisms that have been genetically engineered for the task.

Everything in the factories of the future will be run by smarter software. Digitisation in manufacturing will have a disruptive effect every bit as big as in other industries that have gone digital, such as office equipment, telecoms, photography, music, publishing and films. And the effects will not be confined to large manufacturers; indeed, they will need to watch out because much of what is coming will empower small and medium-sized firms and individual entrepreneurs. Launching novel products will become easier and cheaper. Communities offering 3D printing and other production services that are a bit like Facebook are already forming online—a new phenomenon which might be called social manufacturing.

The consequences of all these changes, this report will argue, amount to a third industrial revolution. The first began in Britain in the late 18th century with the mechanisation of the textile industry. In the following decades the use of machines to make things, instead of crafting them by hand, spread around the world. The second industrial revolution began in America in the early 20th century with the assembly line, which ushered in the era of mass production.

As manufacturing goes digital, a third great change is now gathering pace. It will allow things to be made economically in much smaller numbers, more flexibly and with a much lower input of labour, thanks to new materials, completely new processes such as 3D printing, easy-to-use robots and new collaborative manufacturing services available online. The wheel is almost coming full circle, turning away from mass manufacturing and towards much more individualised production. And that in turn could bring some of the jobs back to rich countries that long ago lost them to the emerging world.

NEW YORK CITY was once the capital of manufacturing in America, with more than 1m people working in the sector in 1950. Today that number has shrunk to a mere 80,000, and they are employed largely by specialist producers in areas such as furnishing, food processing and the cluster that makes up Manhattan's vibrant garment district. Yet nourished by the city's entrepreneurial spirit, a new industry is emerging. It might be called social manufacturing.

One of the firms involved is Quirky, which is as trendy as its name suggests. Its new design studio in a converted warehouse near the Hudson river includes a small factory complete with a couple of 3D printers, a laser cutter, milling machines, a spray-painting booth and other bits of equipment. This prototyping shop is central to Quirky's business of turning other people's ideas into products.

With the help of a growing online community, Quirky comes up with two new consumer products a week. It works like this: a user submits an idea and if enough people like it (as on Facebook), Quirky's product-development team makes a prototype. Users review this online and can contribute towards its final design, packaging and marketing, and help set a price for it. Quirky then looks for suitable manufacturers. The product is sold on the Quirky website and, if demand grows, by retail chains. Quirky also handles patents and standards approvals and gives a 30% share of the revenue from direct sales to the inventors and others who have helped.

Quirky's most successful product so far is called Pivot Power. It is a $29.99 electrical extension lead with adjustable sockets, which makes it easier to plug in different chargers. Jake Zien of Milwaukee came up with the idea when he was at high school, submitted it to Quirky and was helped by 709 people to bring it to market. By early April, with over 200,000 of the gadgets sold, Mr Zien had made $124,000 from his invention.

By using its community as a sounding board, Quirky can quickly establish if there is a market for a product and set the right price before committing itself to making it. Much of the firm's production is carried out by subcontractors in Asia, particularly China. The speed with which they can turn designs into products is hard to match anywhere else, says Ben Kaufman, Quirky's chief executive. Additive manufacturing is not yet capable of doing this on a large scale, he points out, but that could change.

Quirky is hoping to make more things in America because it sees benefits in being close to manufacturing technology. "The amount of creativity that happens when you are standing next to a machine that's making hundreds of thousands of things is much greater than when you are working 4,000 miles away," says Mr Kaufman. "Your mind is spinning as to what else you can design for the machine to make."

Shapeways, another online manufacturing community, specialises in 3D-printing services. Founded in 2007 in Eindhoven in the Netherlands, where it maintains a European production centre, the company moved its headquarters to New York City, where it is setting up a second 3D-printing operation. Last year Shapeways shipped 750,000 products, and the numbers are growing rapidly. Shapeways' users upload their designs to get instant automated quotes for printing with industrial 3D-printing machines in a variety of different materials. Users can also sell their goods online, setting their own prices. Some designs can be customised by buyers, for example by putting their initials on cufflinks.

Easy online access to 3D printing has three big implications for manufacturing, says Peter Weijmarshausen, Shapeways' chief executive. The first is speed to market: Shapeways had covers for iPads on sale just four days after Apple first launched the device in 2010. Second, the risk of going to market falls to almost zero because entrepreneurs can test ideas before scaling up and tweak the designs in response to feedback from buyers. Some Shapeways products go through 20-30 iterations a year. And third, it becomes possible to produce things that cannot be made in other ways, usually because they are too intricate to be machined.

Can you imagine?

There are plenty of surprises in what people come up with. Recent examples include curious crablike walking devices, some propelled by a small windmill, designed by Theo Jansen, a Dutch

artist (the Dutch seem to have a natural affinity with 3D printing). These are printed in one go, complete with all the moving parts. "If you give people access to creative technology in a way that is not scary they will find ways to use it that you cannot imagine," says Mr Weijmarshausen. And that technology is becoming easier to use all the time. When Shapeways began, half the files uploaded could not be printed because of mistakes or faults. Now the success rate has gone up to 91%, thanks to software that automatically fixes problems.

Rajeev Kulkarni, who runs 3D Systems' consumer business, wants his firm's first consumer 3D printer to be simple enough for children to use. Cubify, its online consumer service, also provides 3D printing and e-commerce, and is forming partnerships with organisations such as Freedom Of Creation, a design group that specialises in 3D-printed products.

Once in digital form, things become easy to copy. This means protecting intellectual property will be just as hard as it is in other industries that have gone digital. Online content will need checking for infringements, says Mr Kulkarni. And there will be some tricky areas. For instance, what happens if a visitor to Disney World in Florida takes a series of pictures of Cinderella's castle, converts them into a 3D digital file and uses that to print and sell models of the castle online? Mr Kulkarni is relaxed: "It is something we will have to figure out, but it should not be a hurdle to innovation."

The internet is already making life easier for traditional manufacturers by allowing them to buy parts and assemblies from all over the world. One online group, Atlanta-based MFG.com, provides a cornucopia of manufacturing services with more than 200,000 members in 50 countries. Firms use it to connect and collaborate, uploading digital designs, getting quotes and rating the services provided. In some ways, online manufacturing communities like this could turn into the virtual equivalent of an industrial cluster.

As online services and software spread more widely, they will also allow customers to take part in the production process. For instance, Dassault Systèmes, a French software firm, has created an online virtual environment in which employees, suppliers and consumers can work together to turn new ideas into reality. It even provides lifelike manikins on which to try out new things. The way products might fail, how they could be fixed and how they can be taken apart for disposal can also be modelled by computers. Software firms call such services "product lifecycle management" because they extend computer modelling from the conception of a product to its demise, which nowadays means recycling.

Just as digitisation has freed some people from working in an office, the same will happen in manufacturing. Product design and simulation can now be done on a personal computer and accessed via the cloud with devices such as smartphones, says Mr Rochelle of Autodesk, the Silicon Valley software company. It means designers and engineers can work on a product and share ideas with others from anywhere. What does this do for manufacturing? The way Mr Rochelle sees it, "it means the factory of the future could be me, sitting in my home office."

USING A 3D PRINTER is like printing a letter; hit the print button on a computer screen and a digital file is sent to, say, an inkjet printer which deposits a layer of ink on the surface of a piece of paper to create an image in two dimensions. In 3D printing, however, the software takes a series of digital slices through a computer-aided design and sends descriptions of those slices to the 3D printer, which adds successive thin layers until a solid object emerges. The big difference is that the "ink" a 3D printer uses is a material.

The layers can come together in a variety of ways. Some 3D printers use an inkjet process. Objet, an Israeli 3D-printer company, uses the inkjet head to spray an ultra-thin layer of liquid plastic onto a build tray. The layer is cured by exposure to ultraviolet light. The build tray is then lowered fractionally and the next layer added. Another way is fused deposition modelling, a system used by Stratasys, a company based in Minneapolis. This involves melting plastic in an extrusion head to deposit a thin filament of material to build the layers.

Other systems use powders as the print medium. The powder can be spread as a thin layer onto the build tray and solidified with a squirt of liquid binder. It can also be melted into the required pattern with a laser in a process called laser sintering, a technology which EOS, a German firm, uses in its additive-manufacturing machines. Arcam, a Swedish company, fuses the powder in its printers with an electron beam operating in a vacuum. And these are only some of the variations.

For complicated structures that contain voids and overhangs, gels and other materials are added to provide support, or the space can be left filled with powder that has not been fused. This support material can be washed out or blown away later. The materials that can be printed now range from numerous plastics to metals, ceramics and rubber-like substances. Some machines can combine materials, making an object rigid at one end and soft at the other.

Some researchers are already using 3D printers to produce simple living tissues, such as skin, muscle and short stretches of blood vessels. There is a possibility that larger body parts, like kidneys, livers and even hearts, could one day be printed—and if the bio-printers can use the patient's own stem cells, his body would be less likely to reject the printed organs after a transplant.

Food can be printed too. Researchers at Cornell University have already succeeded in printing cupcakes. The "killer app" with food, almost everyone agrees, will be printing chocolate. ■

STUDY CONTENTS

Introduction

It's widely acknowledged that the maker movement is having far reaching effects on business, our economy, even our everyday way of life. This survey, commissioned by MAKE and Intel, comes out of the need for the maker community as a whole, and the design, hardware/software, consumer electronics and other commercial enterprises in particular, to document and understand maker behavior and attitudes.

This report covers the following topics:

- How makers describe themselves
- The types of projects makers are involved in
- Hardware/tools they use
- Collaboration and sharing
- Relationship with business initiatives
- Business funding and crowdfunding
- Maker innovators by segment
- Maker demographics (personal, education and business)
- Attitudes towards making and corporate manufacturers

We hope you find this report useful in providing insight into how technology and tools, in concert with collaboration, are inspiring innovation from makers at the forefront of the maker movement.

> **"As manufacturing goes digital, it will change out of all recognition. And some of the business of making things will return to rich countries."**
>
> —The Economist, 4/21/12

Methodology

Karlin Associates, LLC, an independent market research company, conducted the **Maker Market Study** on behalf of MAKE and Intel, the survey sponsors.

The sample consisted of a **cross section of the "maker universe,"** as defined by a random sample drawn from three MAKE sources:

- **Maker Faire exhibitors**
- **MAKE magazine subscribers**
- **MAKE newsletter subscribers**

Duplication between the lists was removed as were non-U.S. list members (the scope of the survey was confined to respondents residing in the U.S.).

The survey was **conducted over the internet** among a random sample drawn from the maker universe list.

List members were invited to take the survey on May 1, 2012 in an email from Dale Dougherty. Those who clicked on the invitation's unique survey url were taken to an online, interactive survey. The incentive for the survey was one of five $100 Visa Gift checks. The median time to complete it was approximately 15 minutes.

A reminder email was sent to non-respondents on May 3, 2012. Data for this report are based on **789 respondents** downloaded on May 4, 2012.

Karlin Associates was responsible for all survey operations. All work followed established market research practices.

> **"Digitization in manufacturing will have a disruptive effect every bit as big as in other industries that have gone digital, such as office equipment, telecoms, photography, music, publishing and films."**
>
> —The Economist, 4/21/12

Executive Summary

> Maker self-descriptions and the types of projects they do

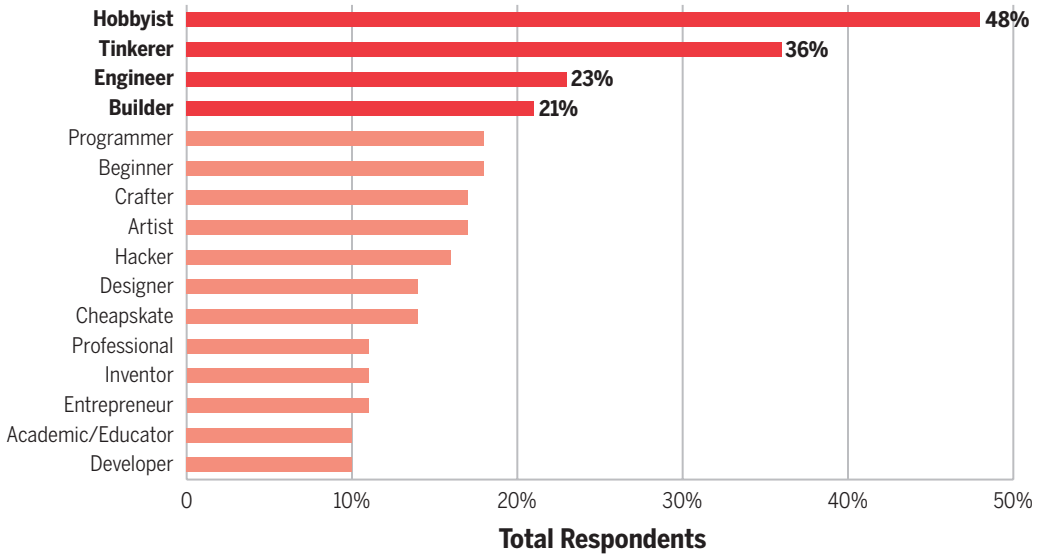
"Makers can play in niches that big firms ignore—though they are watching the maker movement and will borrow ideas from it."

—Dale Dougherty, as quoted in The Economist, 12/3/11

Makers were given a list of 28 terms to describe themselves. To keep things manageable, if they selected more than five, they were asked to narrow the list to five or fewer. (This was acceptable to almost all of them; the survey gave them a choice.)

How would you describe yourself as a maker?

Out of all 28 categories, makers chose "hobbyist" and/or "tinkerer" the most, followed by "engineer" or "builder."



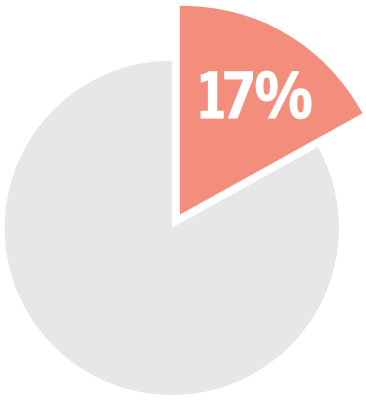
Number of categories chosen

The majority of makers used four or five terms to describe themselves.

one – 17%
two – 8%
three – 16%
four – **30%**
five – **29%**

Leading Edge Makers

17% chose terms identifying themselves as "Leading Edge" makers, defined for the survey as makers who describe themselves as an entrepreneur, innovator, or influencer.



Leading edge makers
- Entrepreneur
- Innovator
- Influencer

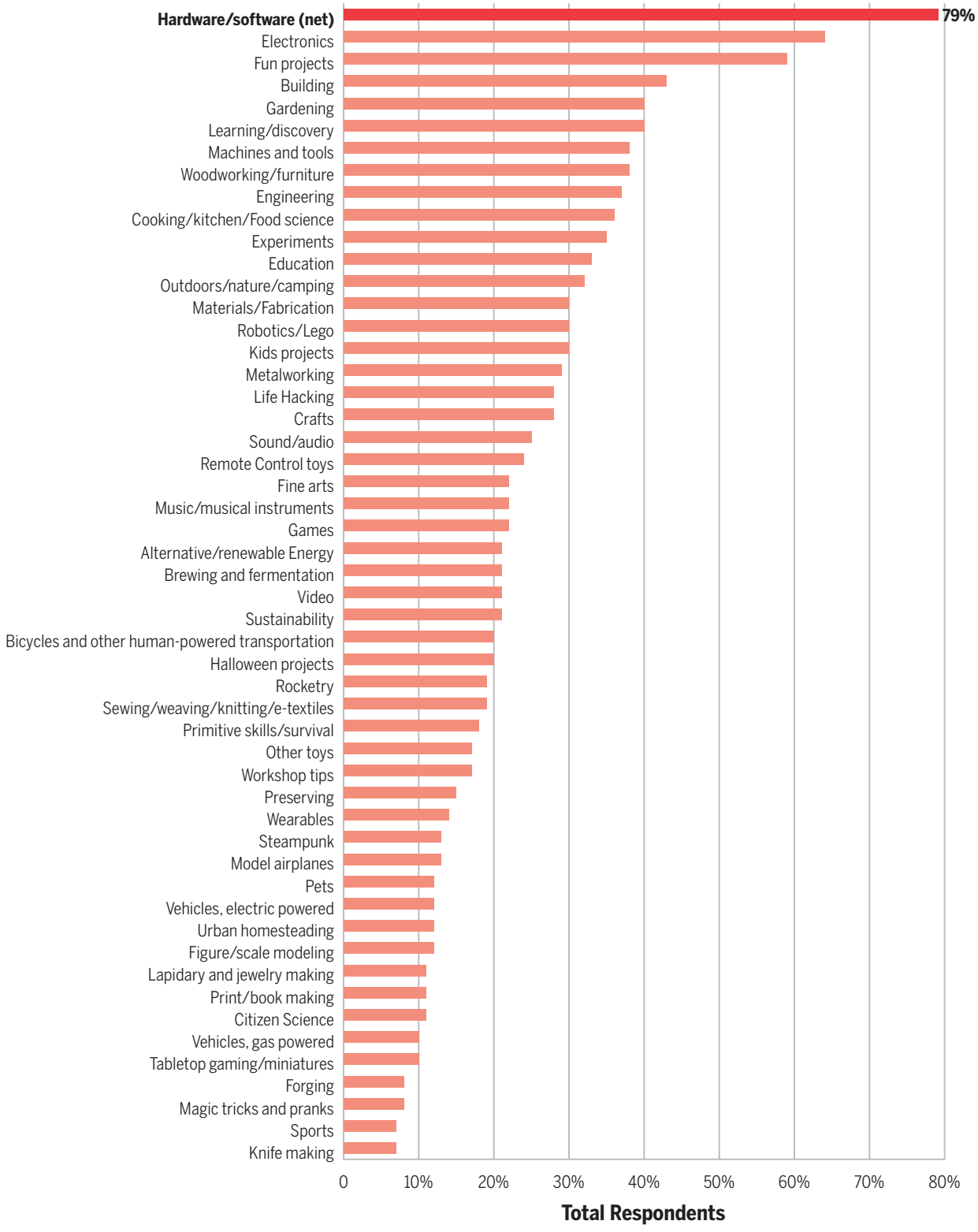
The Leading Edge segment is one of the "innovator segments" covered later in this report.

MAKERS SPEAK!

"I built an autonomous robot which senses colors, organizes, and transfers cargo from one platform to the other. The robot processing was powered by two Arduino uno's."

Type of projects makers are involved in

More makers are involved in projects using hardware (such as microprocessors or 3D printing) than any other category.



> Hardware projects involved in as part of making activity

"New tools and electronic components let people integrate the physical and digital worlds simply and cheaply."

—The Economist, 12/3/11

Hardware/software projects

The vast majority of makers are involved in hardware or software projects.

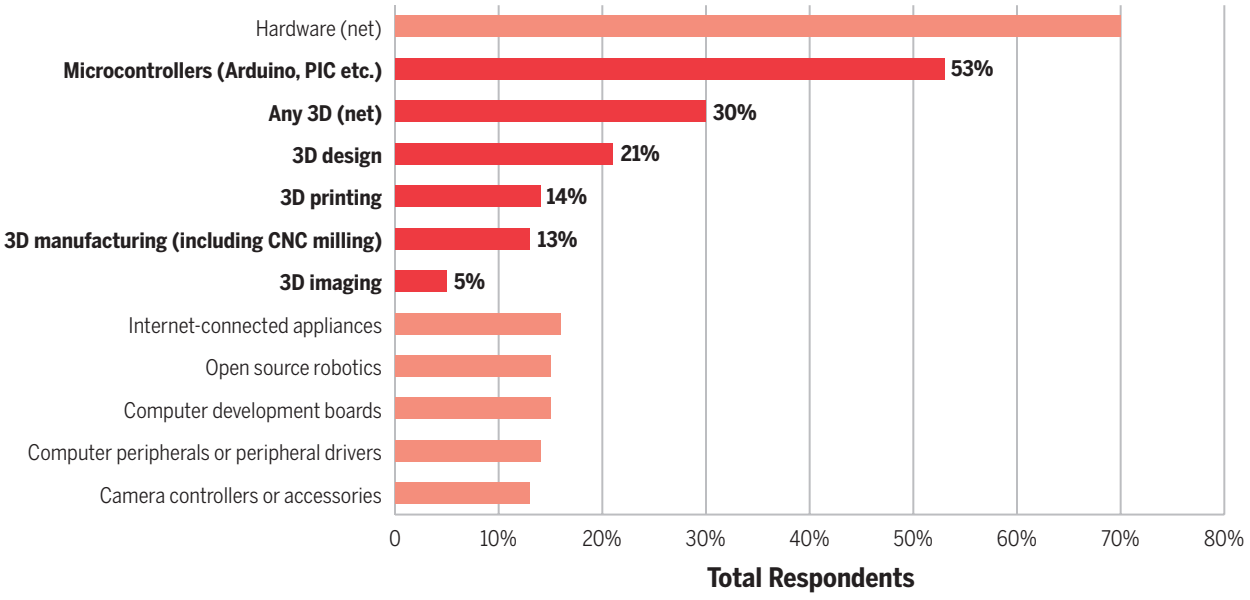
Any of these: 79% of respondents

Hardware: 70% of respondents

Software: 66% of respondents

Types of hardware projects

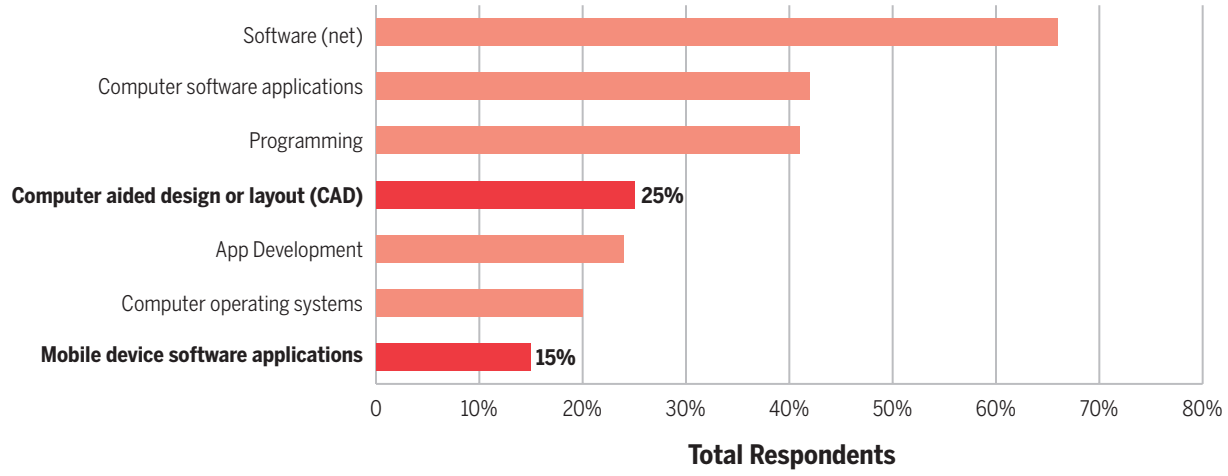
Over half are using microcontrollers (Arduino, PIC, etc.) and 30% use 3D tools and technology.



3D output is an increasingly defining characteristic of makers, many of whom have embraced 3D printing and CNC devices for personal fabrication and prototyping tools.

Types of software projects

Four in ten are using computer-aided design or layout and nearly as many are engaged in application development in their software projects. Interestingly, only 15% are using mobile device software applications—underscoring makers' propensity for hardware as a development platform.



MAKERS SPEAK!

"I made a small temperature controller for my beer fridge by programming a tiny 45 microcontroller using an Arduino. It's a simple tmp36 sensor, a solid state relay and a couple of shift registers that drive a 7 segment display."

> Collaboration and sharing

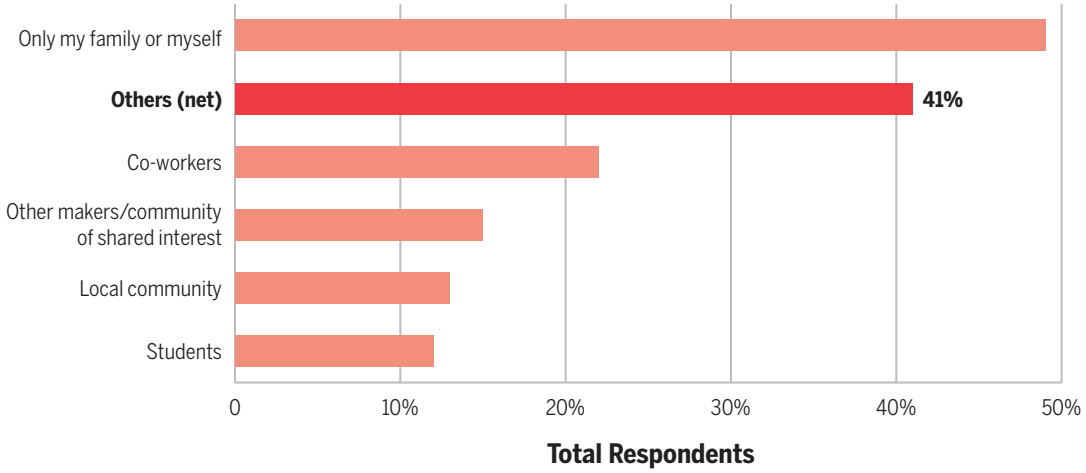
"The ease at which designs for physical things can be shared digitally goes a long way towards explaining why the maker movement has already developed a strong culture."

—The Economist, 12/3/11

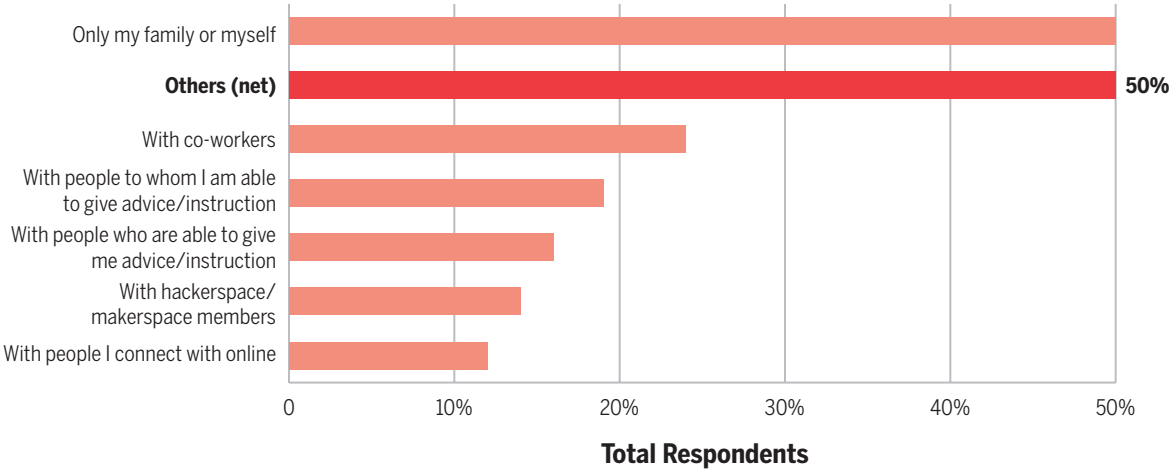
Collaboration and sharing

The survey examined the extent of makers' sharing and collaboration with several questions involving interaction incidents. Overall, 59% of all respondents either said "others use what they make"(41%) or they "make things with others" (50%).

Who uses what you make?

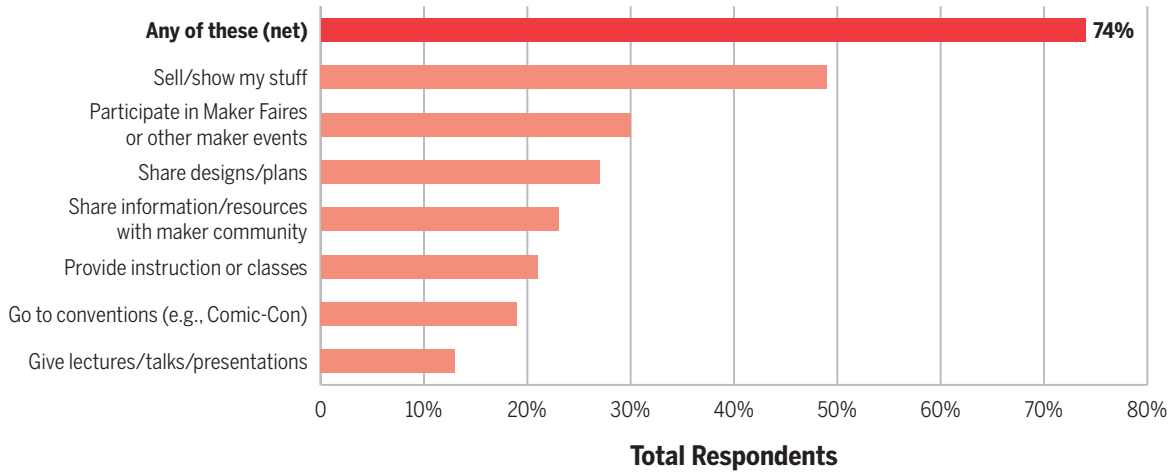


Who do you make things with?



Other sharing/collaborative activities

Taken together three-quarters engage in various activities that demonstrate some degree of commercial, social, online, and/or instruction/class sharing or collaborative activity.

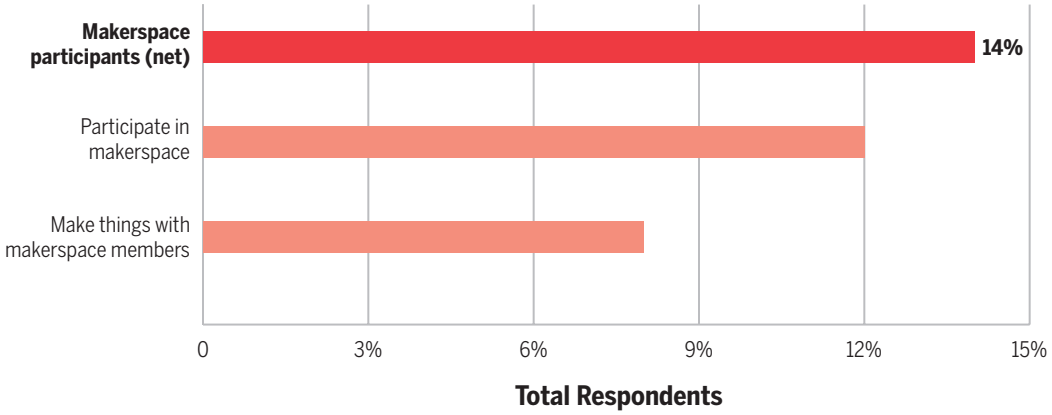


Makerspaces

(Hackerspaces, collaborative workshops)

Makerspace participation

The survey definition of "makerspace participants" is based on answers to two different questions: whether respondents participated in a hackerspace/makerspace as part of the types of things they do as a maker and/or whether they make things with hackerspace/makerspace members.



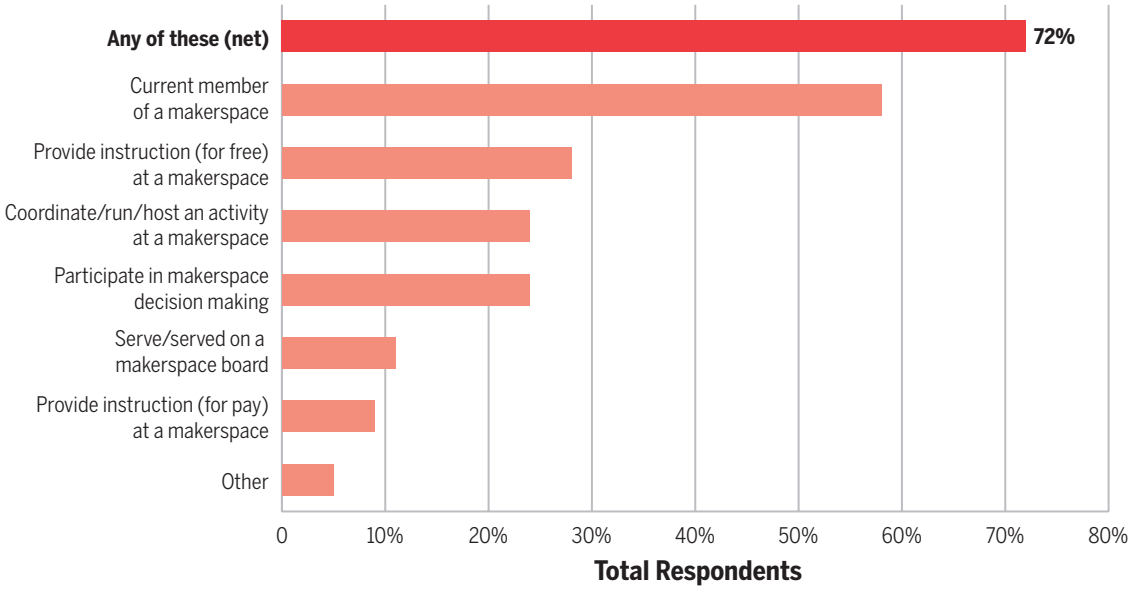
By virtue of the fact these participants actively seek out collaborative spaces, and in many cases, pay a membership fee for access to state of the art CNC tools and technology—as well as to colleagues with different skill sets, this group also comprises one of the innovator segments of this study.

MAKERS SPEAK!

"Planning a community-wide electronics recycling day located at and through my local Makerspace."

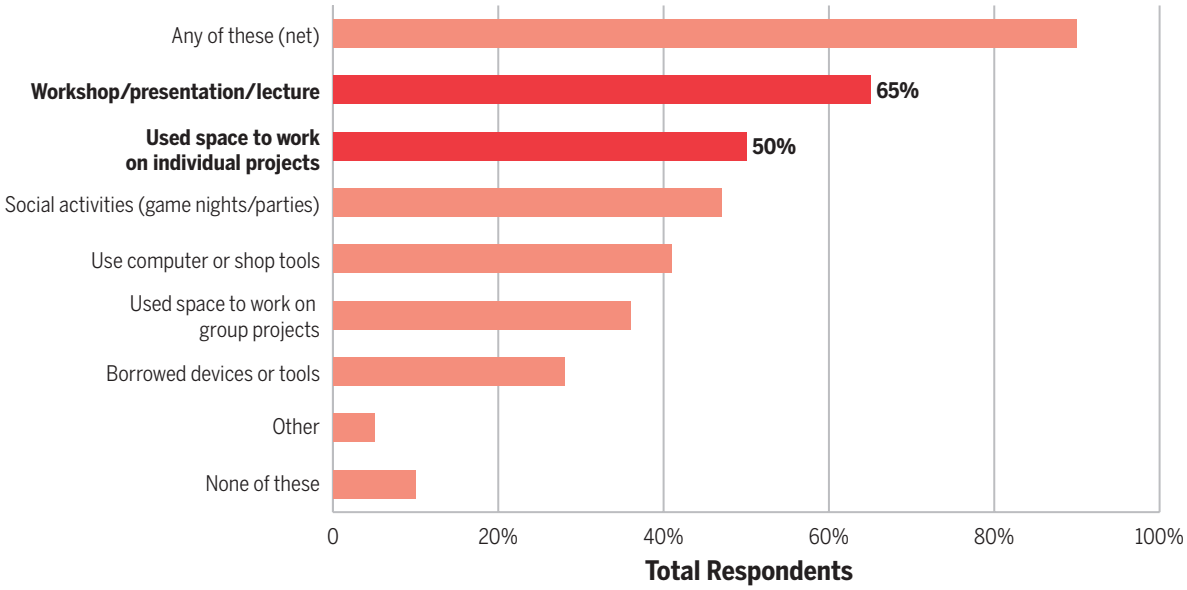
Makerspace involvement with workshops

72% have some type of "formal" involvement with a makerspace, most being current or past members.



Makerspace activity participation in the last 12 months

"Workshop/presentation/lecture" or "used space to work on individual projects" were the most popular choices among makerspace participants.



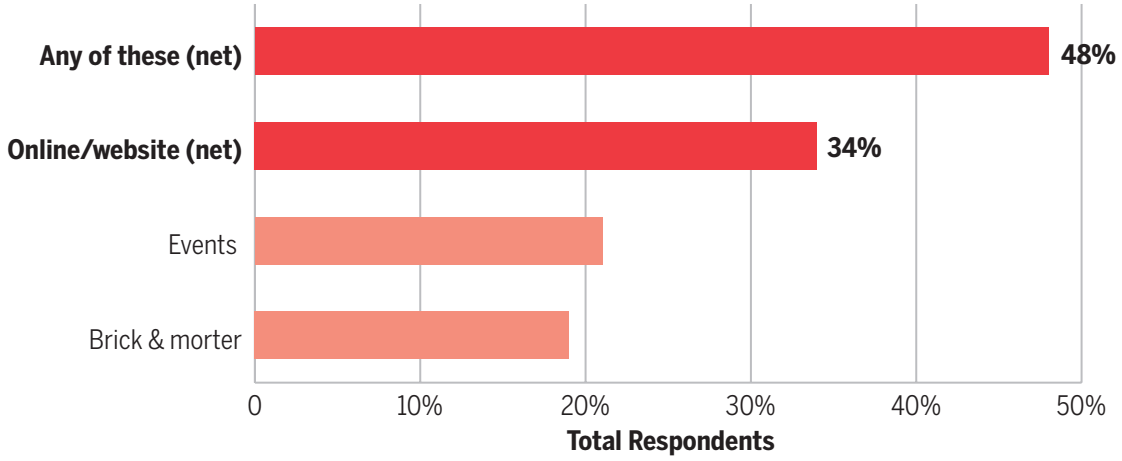
Selling and sharing their work

"Without the upfront cost of brick-and-mortar stores, it's easier than ever to reach an audience and make a buck. And, when anyone can set up an Etsy store to sell knitwear, everyone is a designer."

—Adam Silver, DesignMind Blog, 2/7/12

Whether sold or shown work

About half have sold or shown their work before, most often online.



Website used/plan to use to sell merchandise

Among those that use or plan to use a website to sell or show their work, Etsy was most popular, followed by eBay and Amazon.

Etsy 47%

ebay 39%

amazon.com 26%

> Relationship with business initiatives

"Talented people are going it alone and bringing their designs directly to the market."

—Adam Silver, DesignMind Blog, 2/7/12

Commerce or income-related maker activity

34% indicated a commerce or income activity related to their making. In the report this segment is identified as "income/commerce." These participants are included in the innovator segment as well because their making is driven from a commerce or income-related motivation, suggesting that these makers consider it a means to a commercial end and therefore a business activity.

MAKERS SPEAK!

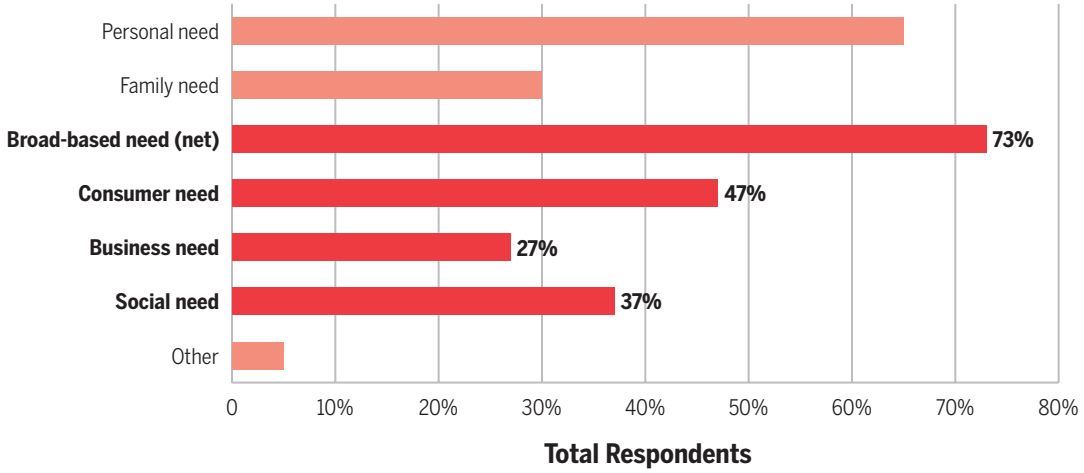
"I am working on learning Arduino and basic programming as well as Lego Robotics. I am also starting a company making custom Lego compatible parts—all of this with my 11 year-old son."

Which of the following apply to you and your activity as a maker?
Altogether, 46% of income/commerce makers said their making activity IS OR WILL BE their job; 20% actually have maker jobs now, while 25% said that making would be their job in the future.

An even larger group of income/commerce makers (56%) said their making activity IS PART of their job.

Needs your products or services address

Nearly three-quarters of income/commerce (73%) are creating products to fill a broader based consumer, social, or business need. The broad based needs that makers' products or services address—from personal to social needs—suggest that makers think "big." They don't approach their making without aforethought about how they can make a significant impact with their efforts. Close to half (47%) believe they are addressing a consumer need and well over one-third (37%) are addressing a social need, perhaps with the goal to improve or enhance the current offering or conditions.



Whether approached by commercial enterprise about idea or prototype

Among all respondents, about one in five (19%) have been approached by a commercial enterprise about an idea or prototype. This expression of interest in the maker movement shows the extent of commercial enterprises' interest in the innovative products, devices, and projects coming out of the maker movement.

Whether applied or plan on applying for a patent or trademark

Over half (56%) have applied or plan to apply for a patent or a trademark.

> Business financing

"Kickstarter's low-risk, high-reward environment is exactly the type of online phenomenon that's encouraging entrepreneurs to make their own stuff."

—Adam Silver, DesignMind Blog, 2/7/12

Clearly, the landscape has shifted in terms of capital resources available to fund new projects and startups. Traditional avenues have been supplemented with options such as crowdfunding via ecommerce platforms like Kickstarter, Indiegogo and others who have created new business models to provide capital to young companies.

Maker project funding

Overall, about one in five (19%) funded or paid for the project with funding from others. Excluding family and friends, one in ten makers funded their projects using more formal financial means. This segment, individuals who believe in the commercial viability of their projects, products or servers, is called "business funded" in the following exhibits and is one of the innovator segments covered later.

Areas pledge money to

86% of those who obtained business funding also pledged money to other makers.

MAKERS SPEAK!

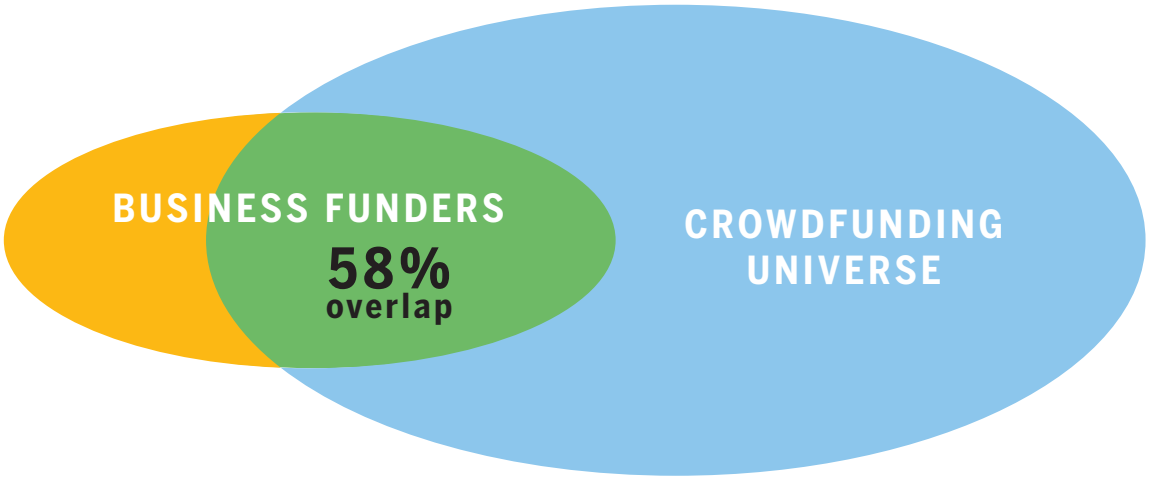
"Hoping to get some more information and ideas to work through kickstarter!"

Makers are saying:

It's good to receive—but also to GIVE BACK.

Incentives offered in return for their own crowdfunding projects

58% of "business funders" have been involved in a crowdfunding project. While still relatively new, with the overnight success of Kickstarter, this is undoubtedly an emerging growth area and a new way to obtain venture capital for startups.



A "thank you" gift was the most popular item offered by makers in return for a money pledge for their own crowdfunding projects (34%).

Crowdfunding sites used or plan to use

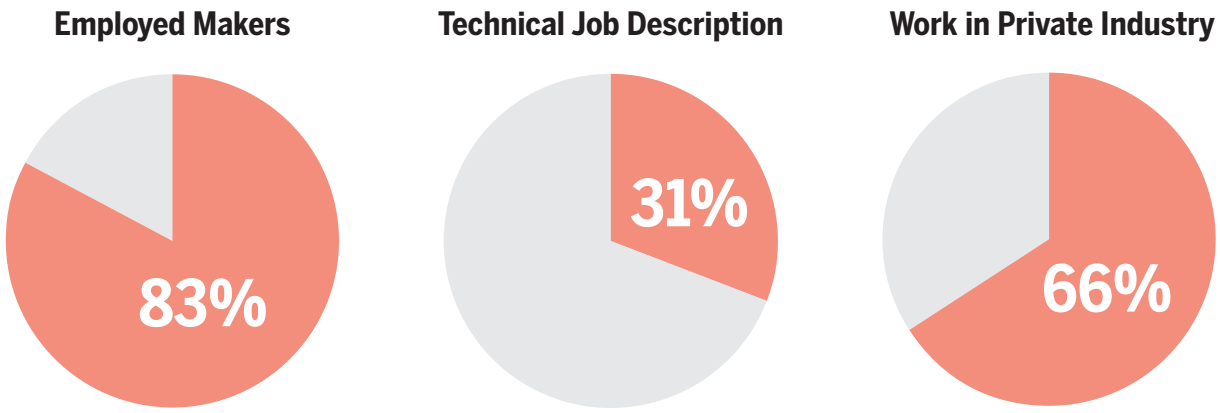
Kickstarter is the most popular crowdfunding site among "business funders."

KICKSTARTER

53%

Business demographics

83% of makers are employed. Nearly one-third of them (31%) have job titles or job descriptions in technical areas such as scientific or engineering. Two-thirds work in private industry.



Basic demographics

Over eight in ten (81%) are male with a median age of 44. Participants also report a high median household income of $106,000 and nearly three-quarters (73%) own their home or apartment. Most are married or living as married with nearly four in ten reporting children under the age of 17 living in the household.

8 in 10 are male; median age 44

Median household income: $106,000

73% own home or apartment

Most are married; 4 in 10 with children

Education

Makers are clearly a well-educated group with 97% having attended or graduated from college; 80% say they have post-graduate education and over four in ten hold post-graduate degrees.

97% attended college

80% post-graduate education

> Segments

Four "innovator" segments were identified and defined:

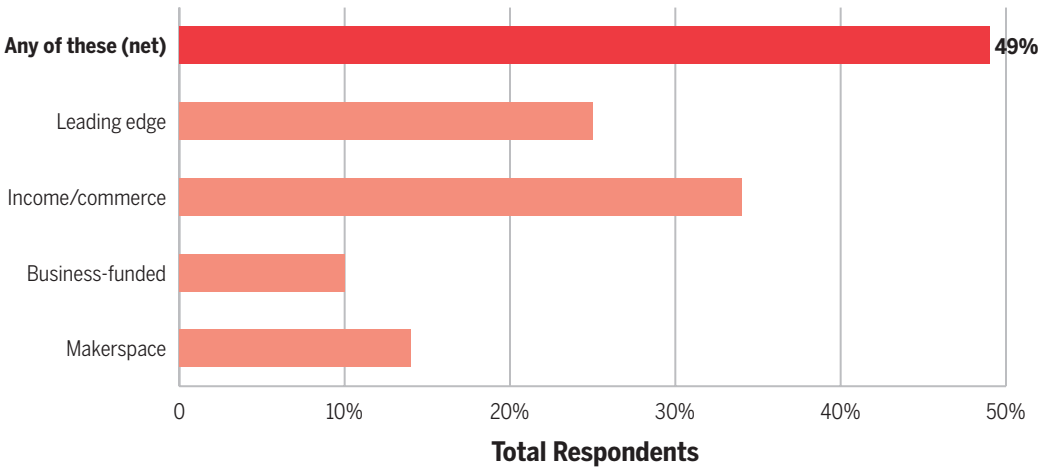
- Makers engaged in commerce or income-related activities
- Self-identified "leading-edge" makers
- Makers who sought funding from a business source
- Makerspace participants

Maker innovator segment Incidence

Half of respondents fit into one of the innovator segments. Income/commerce is the largest; business/funded is the smallest.

Given the diverse universe of makers, overlap exists between the segments: 26% are exclusively in one, the balance are in two or more segments.

The table on the following page summarizes areas where innovators stand out from the typical maker as well as how they resemble and diverge from each other.



	Incidence (rank) among all makers	Index of concentration (All makers = 100)			
		Leading edge	Income/ commerce	Makerspace	Business funded
Approached by a commercial enterprise about a project or prototype	19% (NA)	**225**	**177**	**176**	**308**
How do you describe yourself as a maker?					
Professional	11% (12)	**173**	**173**	136	**227**
Inventor	11% (13)	**227**	145	127	**218**
Entrepreneur	11% (14)	*	**218**	**200**	**309**
Academic/Educator	10% (15)	110	110	**190**	180
Developer	10% (16)	150	100	**180**	90
Advanced	8% (17)	**386**	157	214	**314**
Tools and electronic components					
Open source robotics	18% (11)	144	117	**161**	**161**
Computer development boards	18% (12)	128	111	**161**	128
3D printing	17% (13)	**188**	**171**	**224**	**182**
3D manufacturing	16% (15)	**175**	**163**	163	**169**
Projects					
Education	33% (11)	**142**	**130**	**148**	**179**
Materials/fabrication	31% (13)	**148**	**139**	**158**	**165**
Metalworking	29% (16)	124	**131**	**155**	**134**

NA = Not applicable
*Part of definition
Base: Total respondents

= within segment top 10

Recognition of innovators. Among all makers, the incidence of being approached by a commercial enterprise about a project is 19%. Among innovators, it is much higher. In particular, innovators in the leading edge segment are over two times more likely to be approached; the business funded segment over three times more likely.

How innovators compare to mainstream makers. To assess where innovators diverge from mainstream makers, the 28 terms makers use to describe themselves were ranked, then compared to the top terms that innovators use to describe themselves.

Innovators were more likely to call themselves "professional," and "entrepreneur." As a group they are much more likely to be involved with 3D printing or manufacturing as well as projects involving education and materials/fabrication.

Leading edge and business funded innovators are more likely to consider themselves "advanced" than the other innovator groups while makerspace-type innovators are more likely to be "academic/educators" or a "developer." Innovators in the makerspace segment are more likely to be involved in open source robotics and computer development board projects.

Business demographics. Leading edge and business-funded innovators are more likely to be upper management as well as self-employed, suggesting that former high-level managers have opted out of their companies to launch new ones. Makerspace participants are more likely to work as technical staff.

	Incidence (rank) among all makers	Index of concentration (All makers = 100)			
		Leading edge	Income/ commerce	Makerspace	Business funded
Employment status/job title					
Self-employed*	15%	**211**	**183**	110	**247**
Upper management	19%	**213**	**153**	**127**	**252**
Technical staff	31%	86	77	**112**	68
Industry					
Manufacturing	11%	112	**147**	111	88
Internet	8%	**159**	101	**210**	89
Education	15%	62	89	**122**	83

Base: Employed
*Base: Total respondents

> Attitudes

Respondents were asked to say how strongly they agreed in three batteries of statements about their values, what making means to them, and their perception of corporate manufacturers (asked among the income/commerce segment).

The questions used a 7-point agreement scale. Data are summarized in the following exhibits using top 2 box and bottom 2 box scores. These scores summarize the strongest attitudes associated with a given statement.

Maker values

The majority of makers fell into the "top 2 box" scores (agree strongly or moderately) for all but one of the seven statements in this group, statements like, "ideas should be free," and "it is important... to modify products make by large scale... manufacturers."

	Top Two	Bottom Two
	Agree Strongly/ Agree Moderately	Disagree Moderately/ Disagree Strongly
It is important to me to be able to modify, repair, extend, or repurpose products that are made by large scale, "corporate" manufacturers	**79**	**3**
It is important to me to share my knowledge and skills with other makers	**72**	**2**
It is important to me to recycle and reuse materials in the things I make	**68**	**3**
Ideas should be free	**65**	**3**
I'm mostly interested in solving my own problems with the things I make	**64**	**6**
Intellectual property should be protected by law so that inventors benefit fairly from the use and sale of their inventions	**60**	**5**
I mostly make things by modifying or extending someone else's design rather than starting from scratch	**42**	**12**
Base: Total respondents		

The one statement with a higher "bottom 2 box" score (disagree strongly or moderately) were makers indicating that they were more inclined to make things from scratch than modify pre-existing products.

What making means to them

Makers' passion about their making, in terms of what making things inspires in them (e.g., self confidence, self-esteem and resourcefulness) came through in the strongest terms in this battery of five questions.

	Top Two	Bottom Two
	Agree Strongly/ Agree Moderately	Disagree Moderately/ Disagree Strongly
Making things makes me feel resourceful	**94**	**0**
Making things makes me feel like I can do things I didn't know I could do	**81**	**1**
I would prefer to assemble a product myself so that I know how to fix it if it breaks	**75**	**1**
I would prefer to assemble a product myself if that will mean it is cheaper to buy	**71**	**2**
It is no longer important that people like me are able to fix our own devices with our own tools	**6**	**77**
Base: Total respondents		

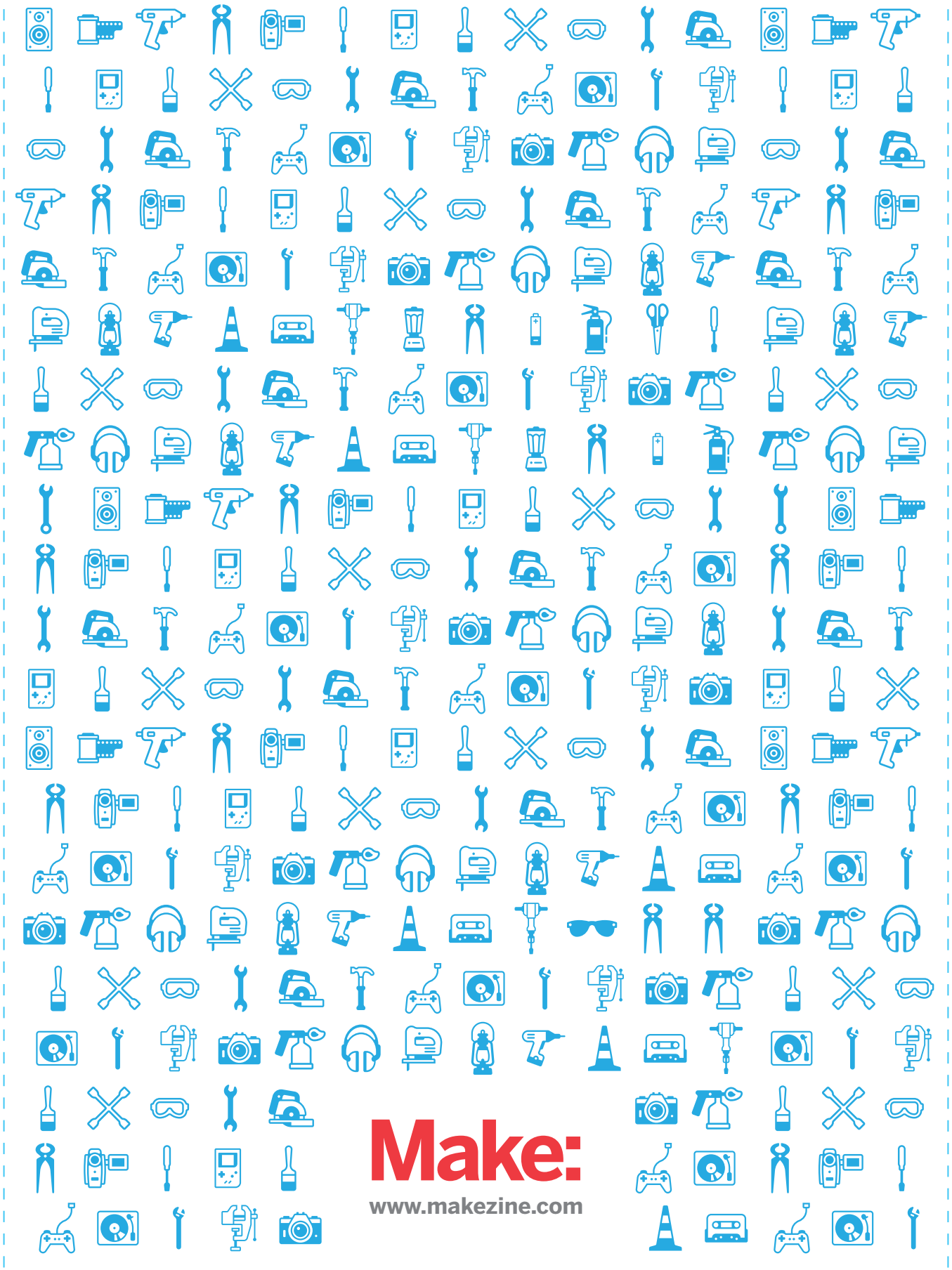
"Resourcefulness" and "empowerment" are key drivers in this group.

Perception of corporate manufacturers and big companies

Among respondents in the income/commerce innovator segment, most strongly believe that corporate manufacturers are more interested in their bottom line than customers' needs. Similarly, this group feels that they would rather buy a product from someone they know than a big company. On the whole, trust in big companies to meet consumer needs is a significant issue for this segment.

	Top Two Agree Strongly/ Agree Moderately	Bottom Two Disagree Moderately/ Disagree Strongly
Most large scale, "corporate"manufacturers are more interested in making profits than in serving consumers	**77**	**5**
Given the option, I would rather buy a product made by a person I know than by a big company	**70**	**2**
Making lots of money is not very important to me	**30**	**20**
Large scale, "corporate"manufacturers seem to be more sensitive to consumer complaints now than they were in the past	**25**	**17**
Large scale, "corporate"manufacturers seldom shirk their responsibility to the consumer	**13**	**44**

Base: Income/commerce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