

The background features a light gray, isometric illustration of a modern office or workshop. It includes various pieces of furniture and equipment such as desks, chairs, a computer monitor, a printer, a coffee machine, and a desk lamp. The style is clean and minimalist, with white outlines and light gray shading.

India Hardware Startup Survey

by
T-Works,
Hyderabad

Contents

Preface	Methodology	Survey Inferences
3	5	7
4	6	12
Executive Summary	Respondent Profile	Survey Results

List of Figures

- 6 Figure 1 : City Profile of Start-Ups
- 6 Figure 2 : Where did they find Co-Founders?
- 8 Figure 3 : Work Premises
- 9 Figure 4 : Support required for various phases
- 9 Figure 5 : Bottle-Neck Activity in Prototyping Phase
- 10 Figure 6 : Necessity of equipment for Electronic Board
- 10 Figure 7 : Necessity of Equipment for Product Development
- 12 Figure 12 : Timelines across different phases across locations

Preface

T-Works is going to be India's largest Prototyping Centre. It is a Telangana Government initiative. With a vision to create and celebrate the culture of makers, doers, tinkerers, hackers, inventors and creators in India, it shall endeavour to lower the barrier-to-entry for enthusiasts, hobbyists, entrepreneurs and businesses to convert an idea into a working prototype in the domains of mechanics, electromechanics, electronics and semiconductor. In an effort to create the desired ecosystem, T-Works shall have the functions of prototyping, incubation, skill development while augmenting it with component sourcing and crowd funding. It is designed to be a collaborative platform for share of talent, share of ideas, exchange of best practices, while providing access to mentors, capital and mass manufacturing.

This survey was conducted by the Telangana Government to understand the desires, wish list, pain points and recommendations of those who are actually involved in the hardware ecosystem. The questionnaire was mailed to startup founders who are developing hardware products in India. It was a comprehensive list of questions that required nearly 25 minutes to fill. The number of responses has been quite satisfactory.

The idea for a survey started off as conversations with hardware entrepreneurs. Every founder we spoke to was more than willing to talk at length about issues facing their startup. Patterns began to emerge based on which an initial model for T-Works was built.

The designed questionnaire is a means to validate our model, to understand if what we learnt from a handful of startups was also valid for a larger set. This survey also gives us a baseline, a measure on where the ecosystem is today so that we can use it to assess the impact of a facility like T-Works later down the years.

We could make this survey a success thanks to our partners at T-Hub, EFY Group, and NASSCOM CoE who have reached out to hundreds of hardware startups across the country. Special thanks also to Qualcomm and National Instruments for circulating this in their community of startups. Thanks to the teams at The Maker of Things, Factly, WH Studio and industry experts for working with us to prepare the survey, analyse results and design the report.

The questionnaire, the report, and the raw data will be made available online for anyone to download and analyse.



Sujai Karampuri,
Director, Electronics
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Executive Summary

Over the last decade, the maker culture has grown into a global trend. The success of this trend is facilitated by Makerspaces and Maker Faires. Management and organization of makerspaces depends largely on the ecosystem prevalent in the region and cannot be copied from another region or country.

India is host to several makerspaces which are contributing to the maker culture. T-Works, the primary subject of the survey, is a Telangana State sponsored facility that aims to build a robust and sustainable ecosystem for hardware product design and development. The survey was designed to understand what the ecosystem lacks and how T-Works (or any similar facility) could potentially fill those gaps.

This report examines the results of the survey in which startup entrepreneurs building hardware products were asked details about their startup journey including team, workplace, equipment preferences, funding, sourcing etc. The survey received responses from 73 startup founders.

Methodology

The survey forms were developed with input from start-ups and industry. The **first version** of the survey was sent to **10 start-ups** who made suggestions to improve the questionnaire.

The **revised survey** form asked respondents specific questions about their entrepreneurial journey. The survey consisted of a total of **42 questions** divided into **6 sections**.

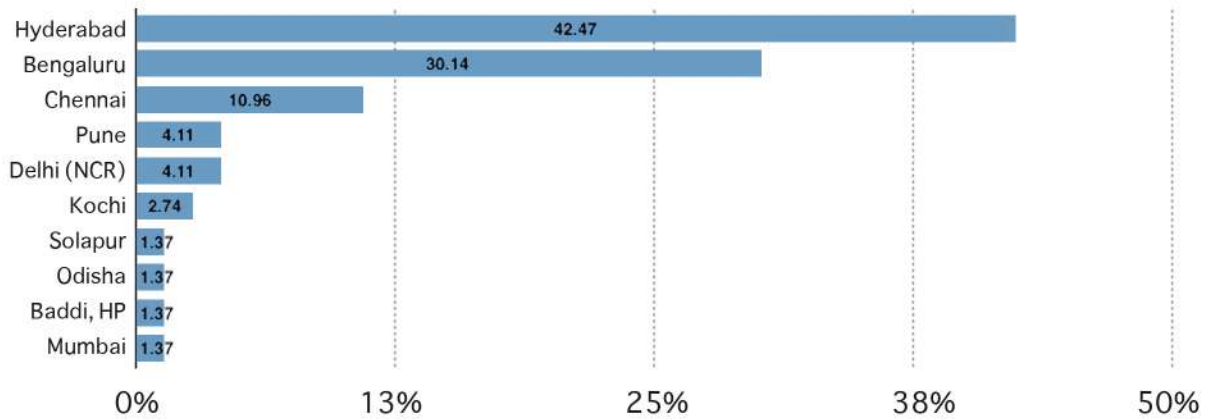
1. Information about the Start-up and Founders
2. Timelines and Funding – divided into the following three categories
 - a. Start-ups in the Prototype Stage
 - b. Start-ups in the Pre-product Stage
 - c. Start-ups with a shippable product
3. Technical Requirements – Electronics
4. Technical Requirements – Materials
5. Testing and Certifications
6. Open ended question

Sections 3, 4 and 5 were context based – needing an answer only if the section was relevant to the startup. Respondents were asked to complete the questionnaire through an online cloud based survey development.

The survey administrators checked returned surveys for missing information and responses that would cause scanning errors. After scanning, the responses were imported into a spreadsheet and errors were checked against the individual forms. Data visualization was completed using visualization tools available online.

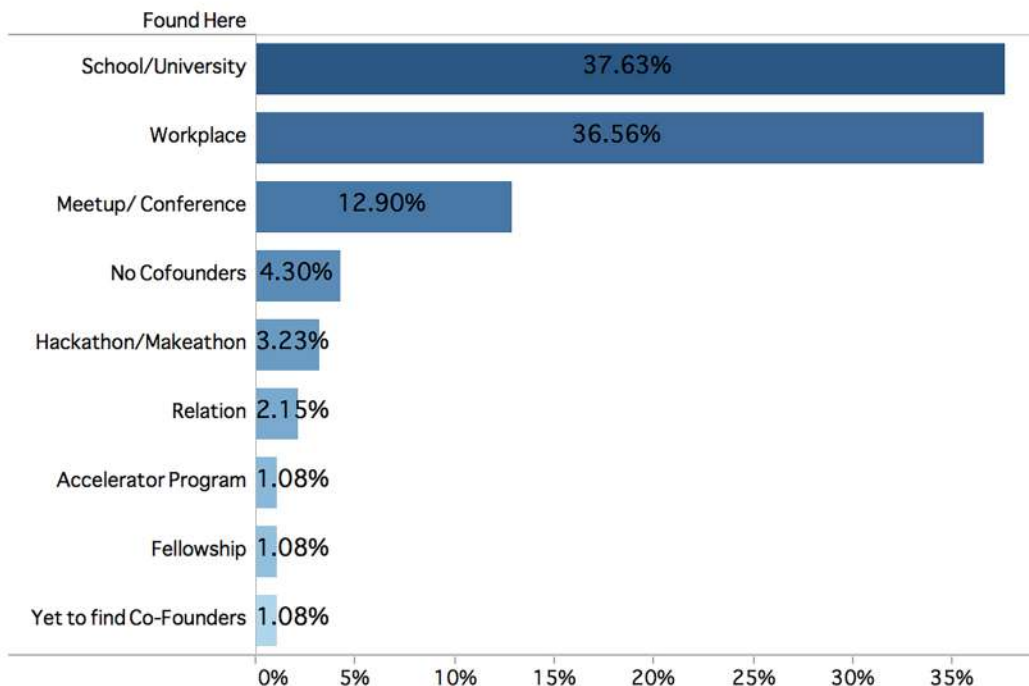
Respondent Profile

The questionnaire received responses from 10 different cities across India. Hyderabad accounted for the highest (42.47%) followed by Bengaluru (30.14%). The other cities were Chennai, Delhi, Pune, Kochi, Mumbai and Solapur. We also received responses from Himachal Pradesh and Odisha.



Founders need colleagues to brainstorm with and for support through the lows of starting up. Co-founders should know each other well, and for at least a few years, and this bonding generally happens at university (38.98%) or at the workplace (37.29%).

Where did they find Co-Founders ?

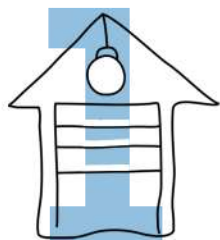


A quarter of respondents had co-founders from non-engineering backgrounds. While a solid engineering background (either through university or self-learnt) is a must for hardware startups to succeed, non-engineers can bring distinct perspectives to product functionality, design, and usability.

70% of respondents were building IoT products in applications such as agriculture, automotive, clean energy etc. This indicates that IoT is treated as a tool with which products are built to suit various application verticals.

Survey Inferences

There was one open ended question toward the end of the questionnaire which allowed respondents to express their opinion on what the Government and T-Works could do to assist them. The responses largely fell into five categories:



Infrastructure

A prototyping centre or lab with testing facilities, equipment and tools, Electronic Design Automation (EDA) and other software licenses, development boards, 3D Printing, CNC machining, etc.



Mentors and Service Providers

The lack of a network of experienced technical mentors and service providers (3D modelling, Industrial Design, manufacturing, etc.) was the second most cited gap by respondents in this question.



Customs and Import, Sourcing Issues

Respondents strongly felt issues with customs was hindering product development. The long wait times and high shipping costs for procuring components are also seen as major hurdles by entrepreneurs in product development.



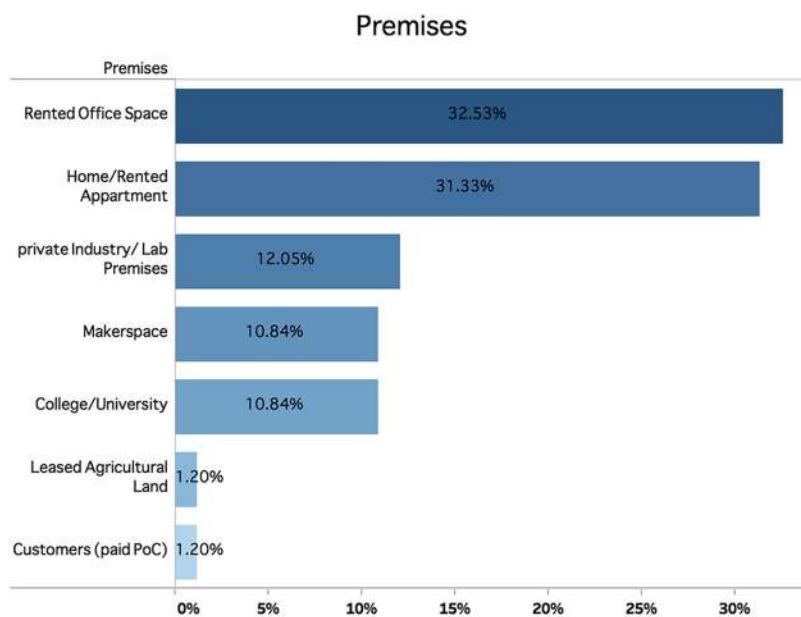
Funding

Early-stage funding was only the fifth most cited issue by hardware startups. This included both investments and access to low-cost capital.

1. Infrastructure

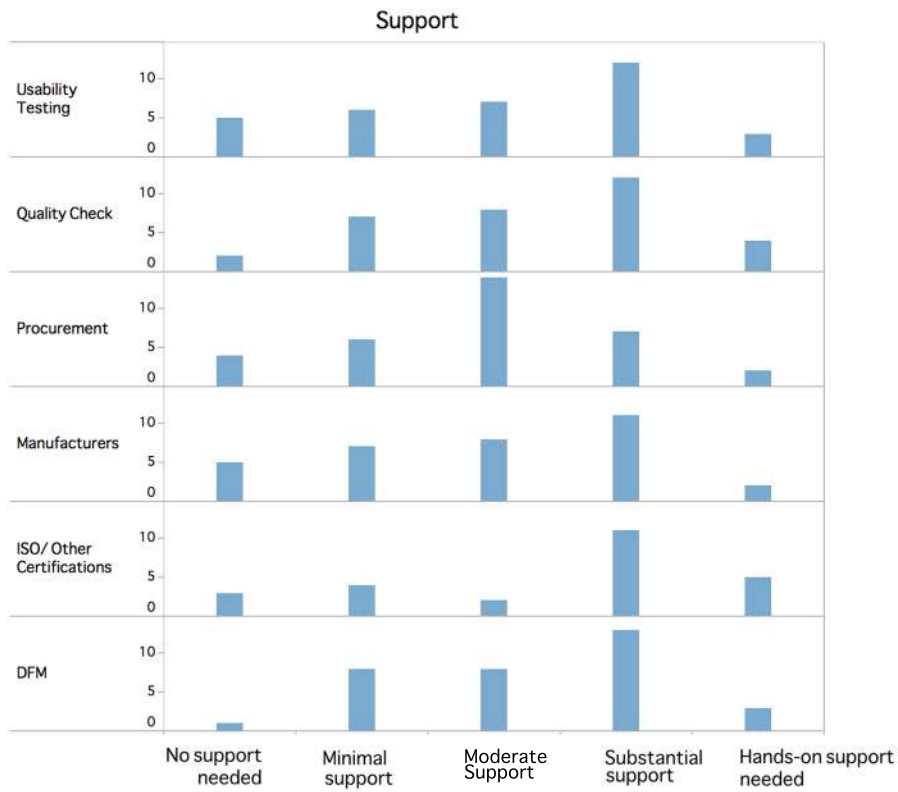
Respondents indicate the need for easily available and affordable prototyping infrastructure to avoid time and cost overruns for fabricating PCBs, 3D printing parts, creating moulds etc. Having these facilities as shared resources within one geographical region is the primary need. A major wishlist item for startups in advanced stages of product development was an affordable and accessible product testing and certification facility. New testing and certification infrastructure can be augmented with existing equipment available with industries and research labs by creating a common network of facilities open to SMEs and hardware startups.

Over 60% of respondents work from a rented apartment or office where they likely also set up a lab or prototyping facility. Any prototyping facility with an aim of fostering a hardware ecosystem must merge prototyping with relevant co-working and office spaces. Given that build volumes vary with application and technology, the facility will need a mix of large and small workspaces which blend in with shop-floors and tool rooms.



2. Mentors and Service Providers

The issue most cited after infrastructure is the need for an ecosystem of peers, mentors, and service providers in the hardware product design, development, and manufacturing space. Sharing knowledge protects innovators from making the same mistakes as their predecessors, helping the ecosystem mature faster. 75% of survey respondents manually searched for potential manufacturers either online or in person. Despite over half the respondents spending three months or more developing the industrial design, 65% needed moderate to complete redesign after meeting a manufacturer. A majority of respondents required moderate to hands-on support for Design for Manufacturability (DFM), quality check, usability testing, procurement of raw materials, and product certifications.

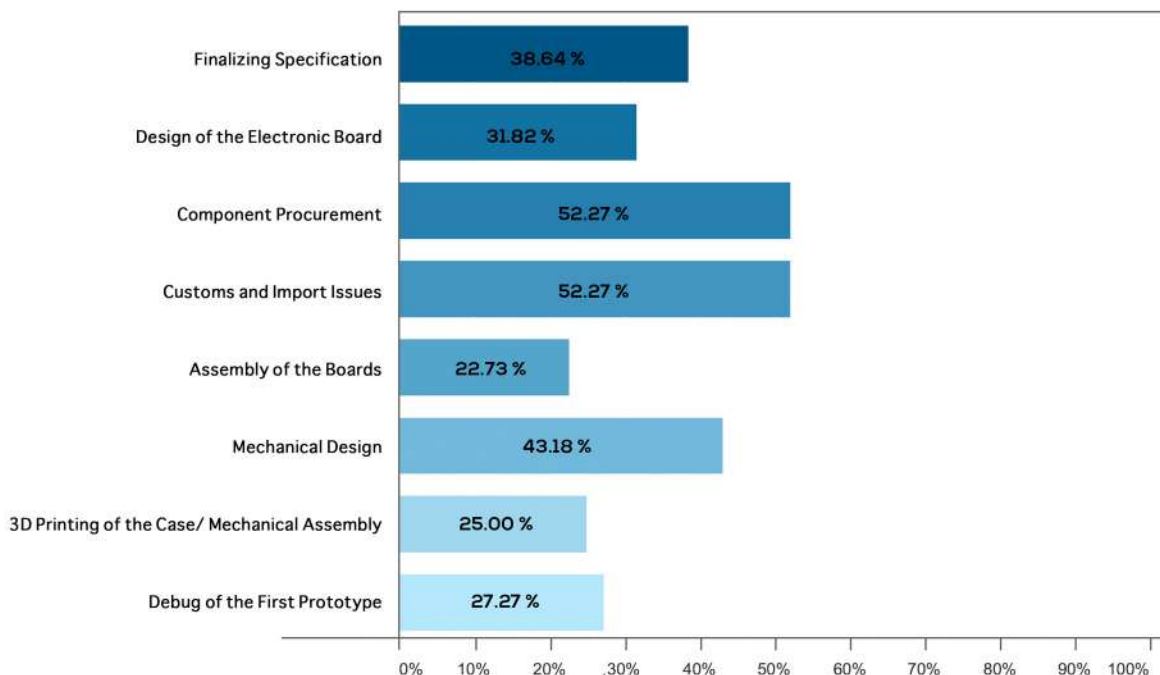


3. Customs and Import, Sourcing

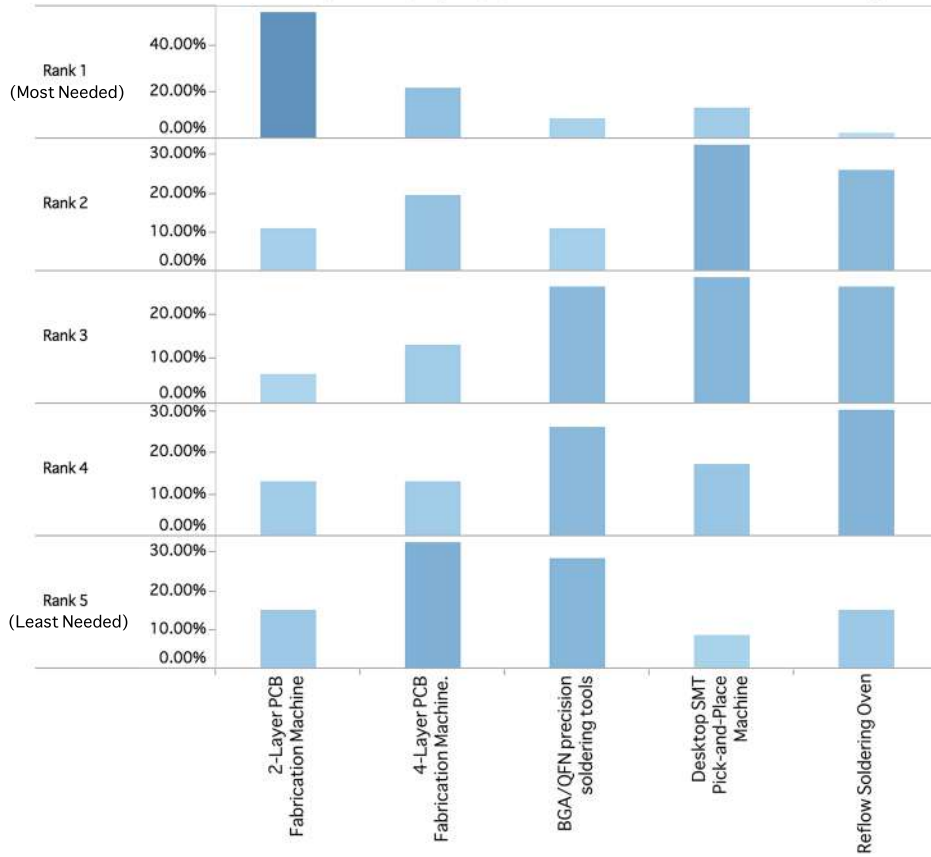
Customs and Imports issues and components procurement were the top two of eight suggested bottle-neck activities. Customs issues can only be addressed by Government, necessitating the need for Government intervention to build a successful hardware product design and development ecosystem.

94% of survey respondents use electronics in their products, irrespective of application or technology domain. Even though the market for electronics components in India exceeds \$10billion (“Turning the Make in India dream into a reality for electronics and hardware industry” - ASSOCHAM-EY study), no major electronics distributor offers overnight delivery in India. Vendors charge a \$20 shipping fee and components can take up to 20 days to arrive. This is detrimental for any hardware startup.

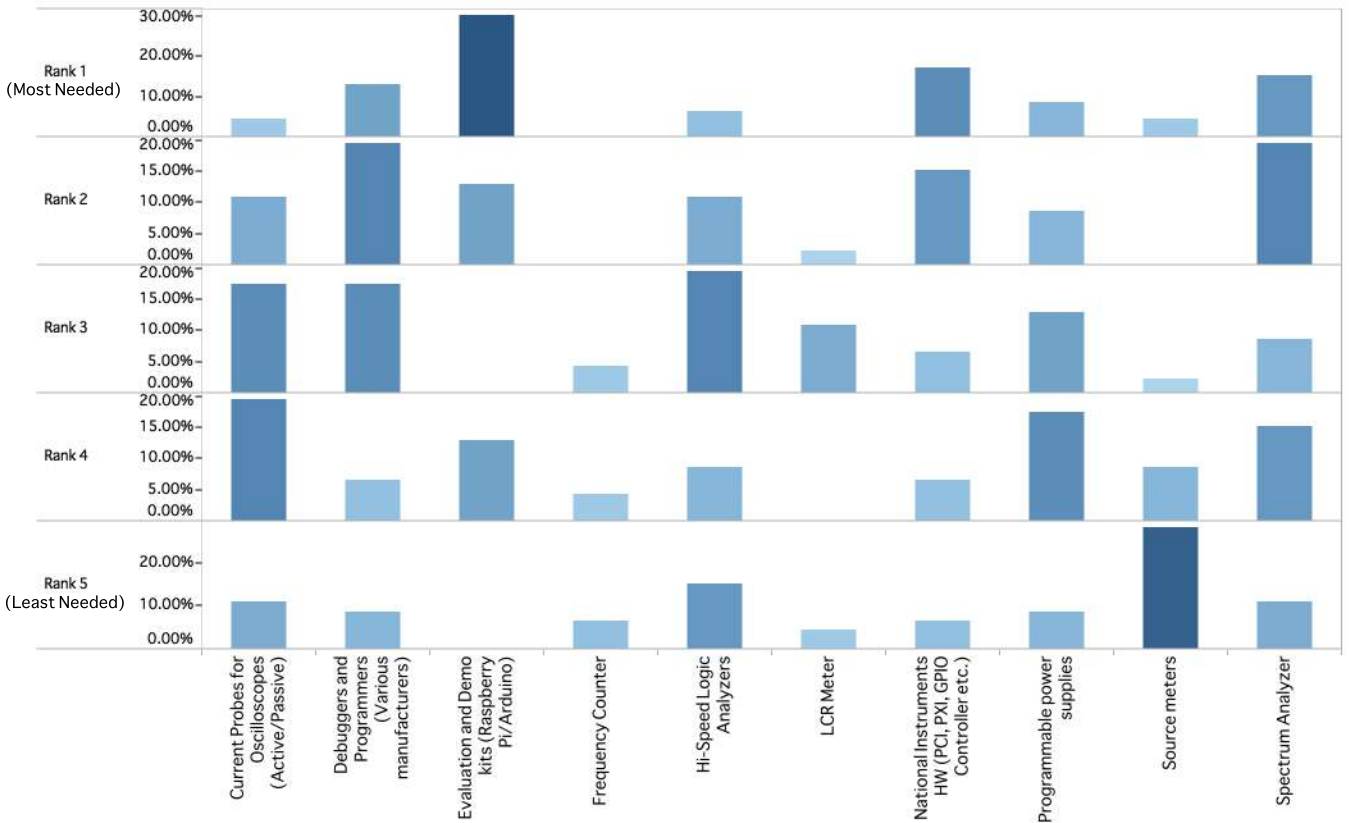
Bottle-Neck Activity in Prototyping Phase



Necessity of Equipment for Electronic Board Design



Necessity of Equipment for Product Development

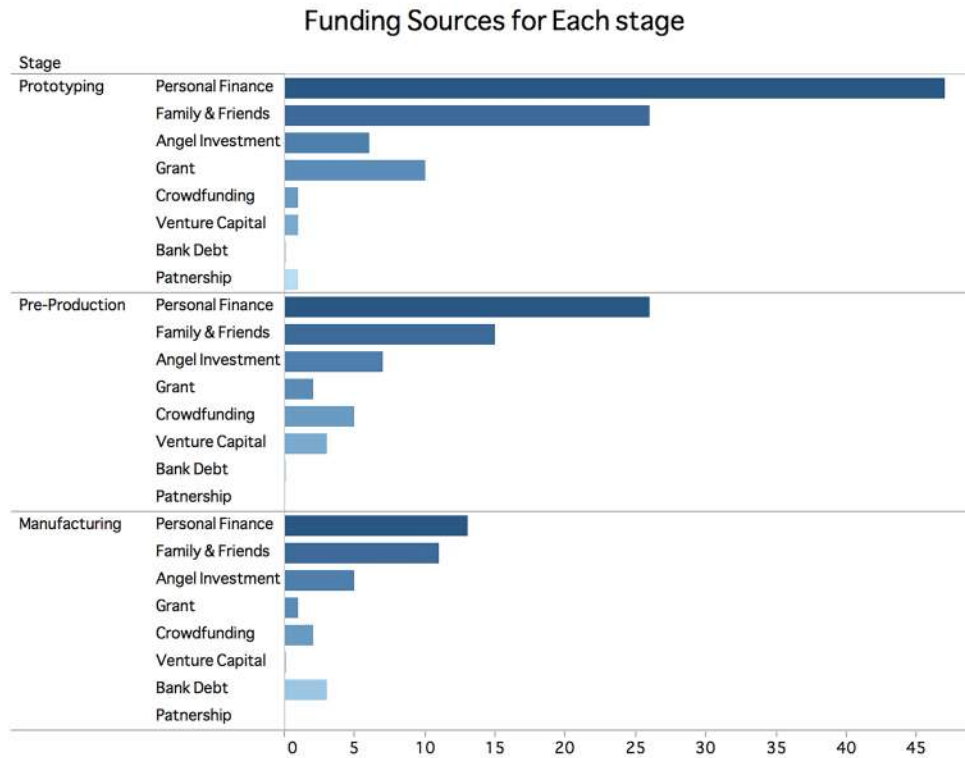


4. Funding

Funding is not among the top three most important issues faced by hardware startups. Respondents also indicate that low-cost capital is at least as good an option as equity investments. Funding, however, is one of the top five issues that need to be addressed to ensure a sustainable ecosystem for hardware product design and development. There was a sense for a need for small early-stage technology demonstrator / proof of concept grants or investments. It is also worth noting that only 10% of respondents used crowdfunding for any stage of product development or for pre-orders. Given the growth of this sector worldwide, especially in hardware, it might be worth filling this gap through awareness and training for new incubatees/tenants.

Survey Results

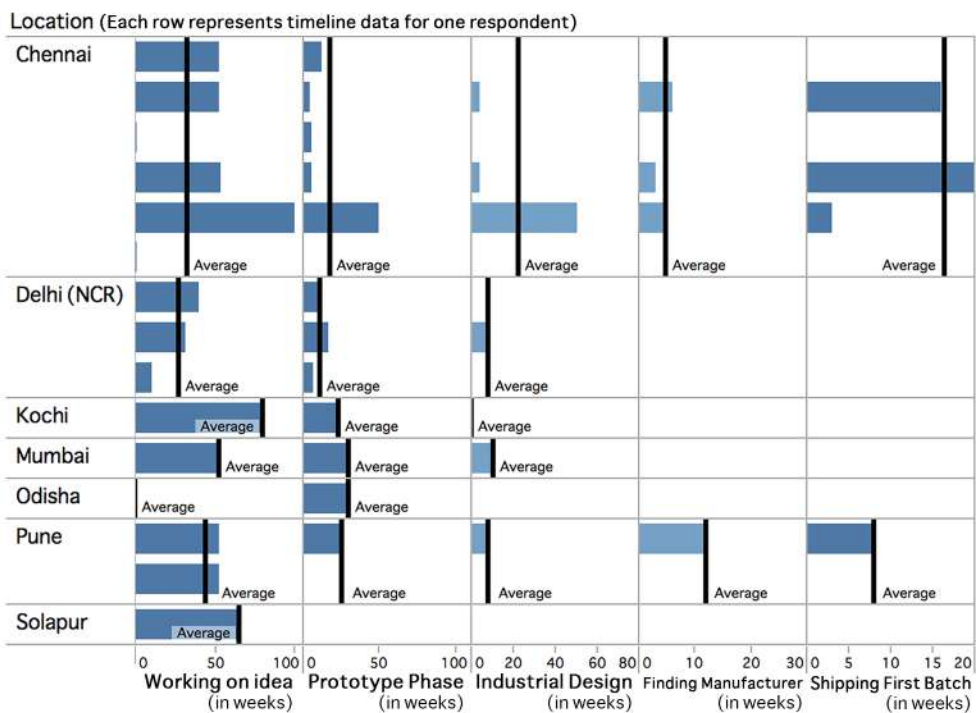
1. An overwhelming majority of funding for hardware startups continues to come from personal finances, friends, and family.



2. Over 60% of respondents work from a rented office space or apartment. Only 11% work from or use a makerspace. (Refer to figure 3 -Work Premises)

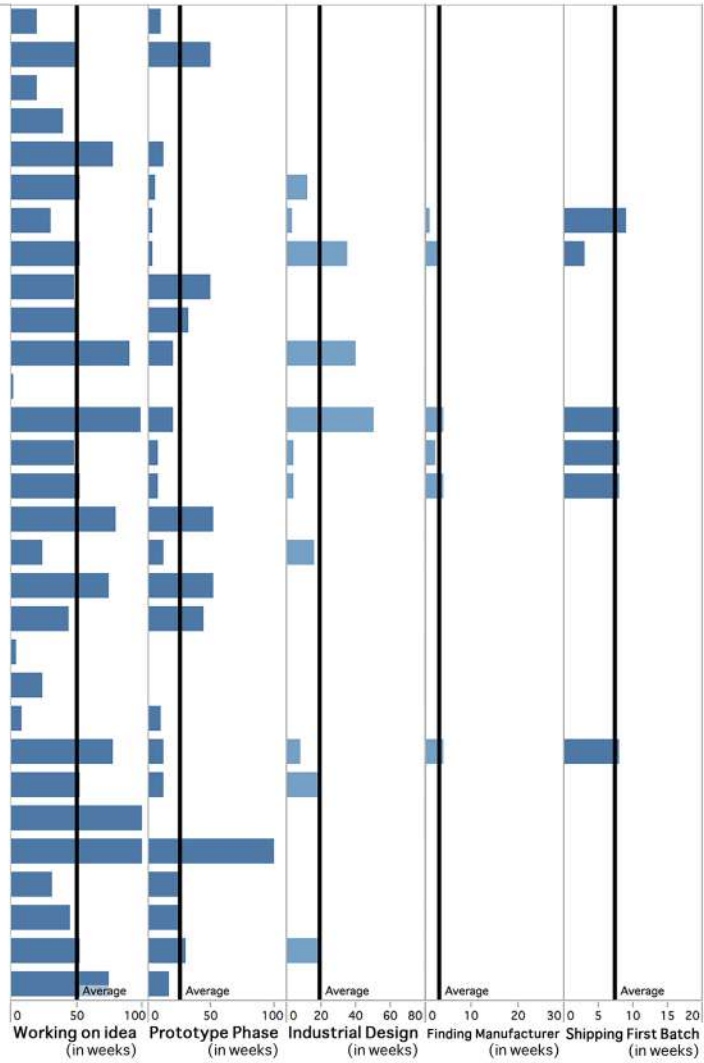
3. Respondents took 19 weeks on average to build their prototype, 17 weeks on Industrial Design, and 6 weeks thereafter to find a manufacturer implying respondents took an average of 42 weeks to go from idea to manufacturing.

Timelines for the companies- Locations : Delhi, Kochi, Mumbai, Odisha, Pune ,Solapur



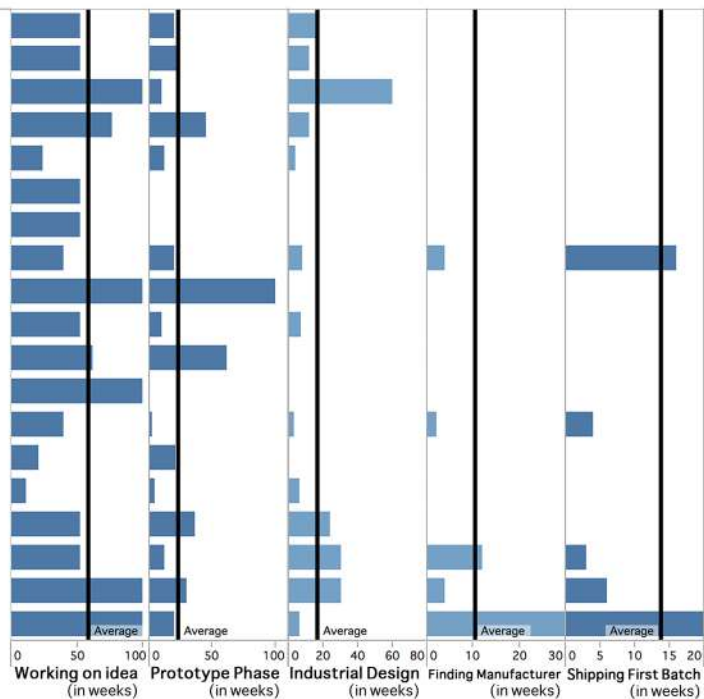
Timelines for the companies - Locations : Hyderabad

*Each row represents timeline data for one respondent



Timelines for the companies - Locations : Bengaluru

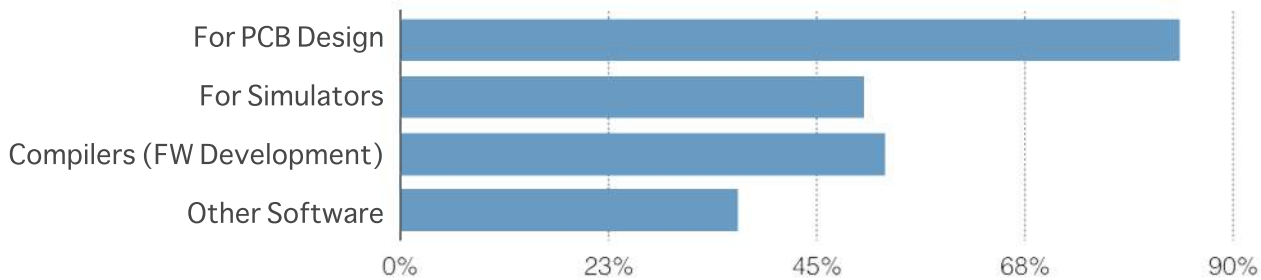
*Each row represents timeline data for one respondent



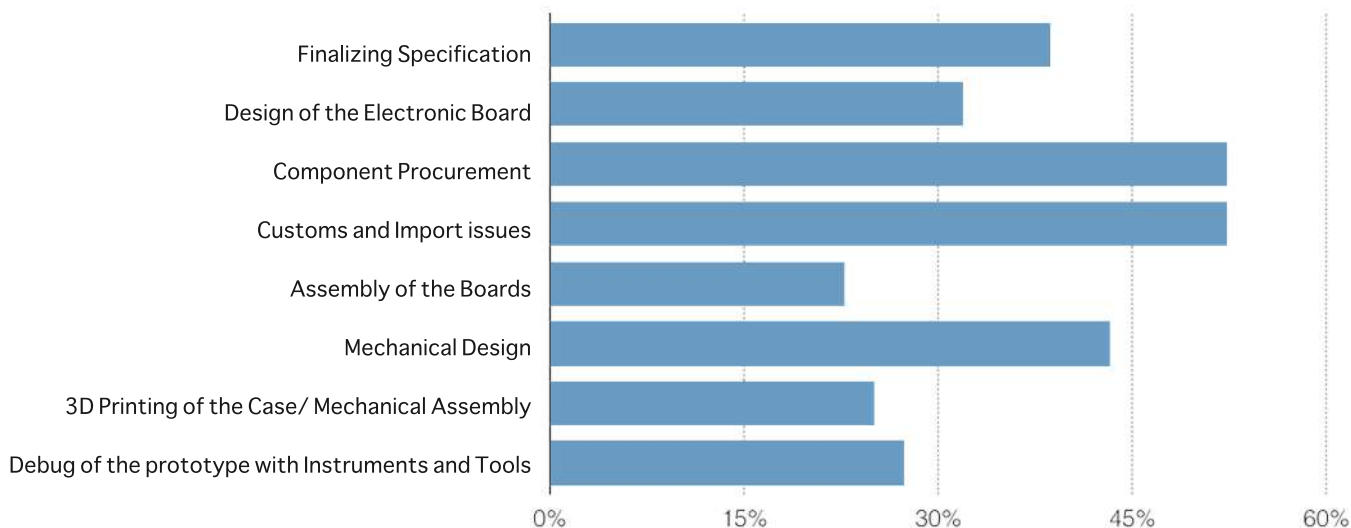
4. 95% of respondents use electronics in their product.

5. 2-layer PCB fabrication is a must-have among respondents, so are evaluation and demo kits (Raspberry Pis, Arduinos etc). (Refer to figure 6)

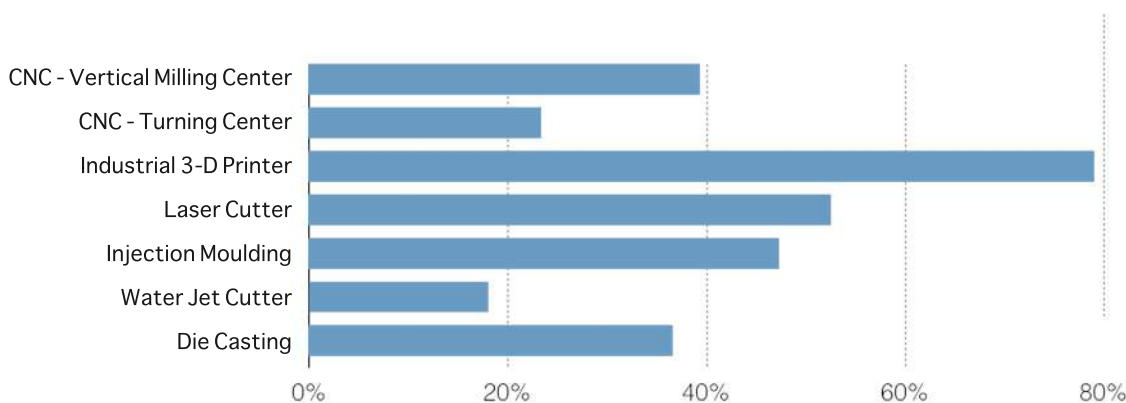
6. All respondents needed software licenses for PCB design (84%), simulations, compilers etc.



7. Respondents cited components procurement and issues with customs as the top two bottlenecks for product development.

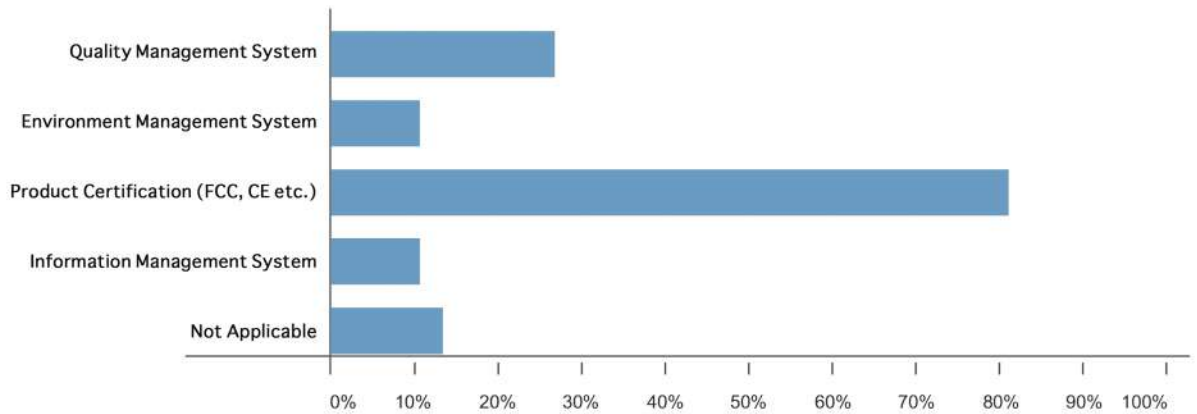


8. 79% respondents required Injection Moulding and industrial 3D printing during product development. Close to 20% also used a waterjet cutter.

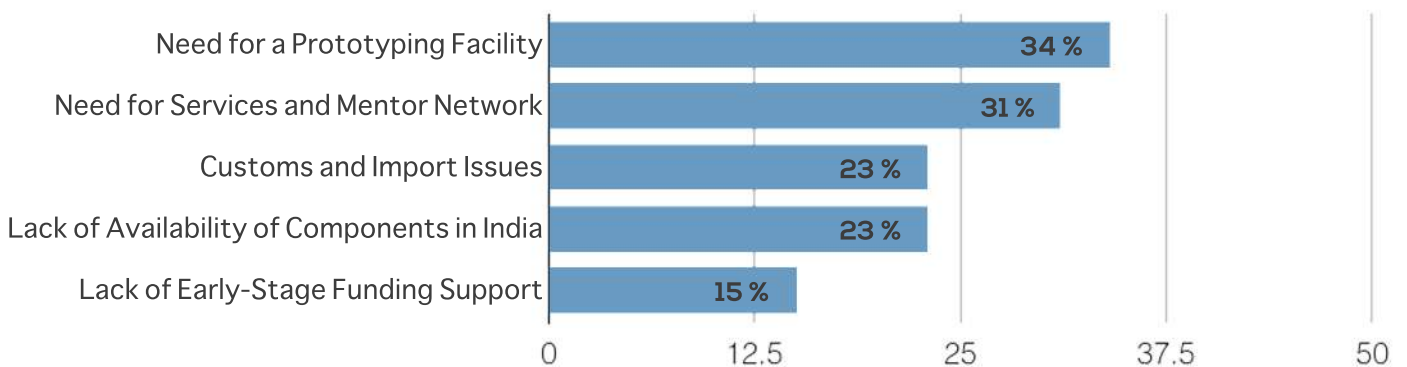


9. Respondents spend substantial amounts (Rs.2-12 lakh) to create a mould.

10. Over half the respondents needed testing and certification facilities during product development, 80% for Product Certification requirements.



Answers to the open-ended question – “If you can ask the government for one thing that would make product development easy for you, what would that be? Do you have any suggestions for setting up T- Works?” – can be divided into five categories. Respondents have cited one or more of these issues in their answers:





T-Works

India's largest prototyping centre



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A Government of Telangana initiative