khosla ventures

Gene Pool Engineering For Entrepreneurs

BY VINOD KHOSLA

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Introduction

A founder, sometimes a business person or early CEO and maybe one or two engineers: this is the typical size of a startup team presenting to us for the first time here at Khosla Ventures. Let's assume that we like the technology, team and market, and decide to fund them. Of course, in every pitch, there's a lot of talk of funding and development milestones, and there also are outlines for which hires will happen when: "We will hire two more engineers in the first three months and a sales guy once we have a first rev on the product." As the entrepreneur though, you may never have recruited a team before. You may not even know enough people in the industry to have a clue where to start looking for those engineers or that one right "sales guy." How many people should you hire? Where should you look? How should you approach them? These are questions that are as important as they are inevitable for every single entrepreneur. Engaging them as early as possible is a key to startup success.

Why First Hires are Important

A strong team is the most important element of a company's ability to achieve success. That wisdom is often stated but seldom turned into specific "actions." I would suggest, especially in startups, a company becomes the people it hires. The first few hires help the founders create the environment they will all work in and help drive the product development process. It is also the team that drives (and interviews) all future hires and their ideas and biases get incorporated in the team. More importantly, without the right first few people, the culture of the startup might not be conducive to what the founders envision for its future. On the flip side, a few mediocre or unmotivated people at the beginning of the startup generally spell doom before the first product is released. There is always talk of startup culture, but it is the founders and their first round of hires that define that culture.

A company becomes the people it hires.

So how does an entrepreneur find the right people? While entire books and journals are devoted to outlining management techniques and secrets and platitudes about good people are abundant, there are far fewer strategies outlined for building successful and, more importantly, "***precisely engineered***" teams through an "actionable and teachable" process. The standard corporate practice for both Fortune 500 firms and startup companies is functional recruiting or recruiting to fit a pre-cast organizational structure. While this can work because it creates a familiar working dynamic for a company's management team, the approach is not sufficient or optimal for the special needs of technology startups. In technology startups, risk management and evolution of plans are the key requirements (hence my statement that a startup becomes the people it

hires because they determine evolution of plans and risk / opportunity tradeoffs), more so than standard strategy, operational and business planning and financial management as in more mature companies. Although these big company attributes are also important in startups, much more is needed in a startup environment. In a startup environment, especially in the early days, one is not expected to solely fulfill a specific function — often it isn't even known what exactly is needed, beyond someone who can add more than just their expertise and contribute to a dynamic culture. Experience has shown me that successful start-ups seldom follow their original plans. The early team not only determines how the usual risks are handled but also evolves the plans to better utilize their opportunities and to address and redefine their risks continuously.

Successful startups seldom follow their original plans. The early team not only determines how the usual risks are handled but also evolves the plans to better utilize their opportunities and to address and redefine their risks continuously.

One quantifiable, teachable and actionable hiring method successfully practiced by Khosla Ventures for developing the optimal mix of team member backgrounds and maximizing the probability of success is "gene pool engineering." This process is not constrained to engineering positions, but we have decided to showcase it in this paper as an example. We suspect the applicability of this technique is far broader than just technology startups but the focus here is on technology startups and teams to address the needs for innovation and high-risk management.

Background on traditional (functional) recruiting

The traditional organizational structure consists of groups headed by senior leadership. We are all familiar with the standard organizational chart comprised of separate teams for marketing, sales, engineering, human resources, etc. Alcatel-Lucent has 16 groups reporting directly to the CEO. Within each silo, a combination of merit, seniority and responsibility determines titles and roles. For example, the organizational structure of Lucent (or NBC or insert the name of your favorite typical large company) consists of product line engineers at 100 and 200 level designations reporting into the more experienced 300 level project managers and vice presidents who are the decision-makers. Within companies adopting this traditional hierarchy, senior managers can become mere tollgates in the decision-making process rather than participants in the problem solving exercise.[1] Most of the time, startups need a culture of experimentation, and an attitude of "change the industry rules, not play by them" is a key requirement. Often in larger, more stable enterprises, repeating yesterday's strategy is 90-percent of the job. In startups, there was no yesterday and one can't use "industry rules" to cause disruption. Knowing how the industry works and having experiences from it — as long as that

[1]Cook, Scott. "Intuit: Culture of Experimentation." KV CEO Summit. California, Cavallo Point. 9 May 2011. Khosla Ventures. Web. <http://www.khoslaventures.com/culture-of-experimentation-scott-cook>.

knowledge does not dominate decision-making — can reduce risks and also help identify new opportunities and industry vulnerabilities. Since generally a startup is trying to upend the industry rules of yesterday, one has to have enough talent to meet industry "requirements" and have knowledge of existing systems while changing the rules of engagement. This nuanced approach to change, innovation and disruption is dependent upon the team one builds. One needs team members to lead and add to the thinking rather than follow a process. To think of and execute on experiments, to lead thinking instead of simply responding to competition and the next increment on a broad base are significant differences in the needs of startups versus bigger, more established entities. This "beyond the functional role" thinking can come from any level of an organization, and team leaders should be open-minded and encouraging of this "experimental" behavior. If a startup instead takes the big company approach, team members are prone to adopt "more of the usual" mentalities and act as individuals who simply feed information up the chain versus cooperate in an environment more conducive to problem-solving, evolutionary planning, flex-planning and experimentation. This big company mentality can be disastrous, as team dynamics driven by a sense of loyalty can often easily encourage individuals to tell the leader exactly what he or she wants to hear, rather than challenge the status quo and tell leaders what they need to hear. This does not apply just to the leadership. Each new hire improves and stretches all of the existing team members in various functional areas beyond their immediate expertise.[2]

Startups need a culture of experimentation, and an attitude of "change the industry rules, not play by them".

Diversity in all forms helps drive "figure out the new" behavior. I recently asked a CEO if he had enough talent. His response was to assure me that he had "15 PhD's" — impressive for a startup project. But when I asked how many were from outside their market, the answer was none. When I asked how many were under age 35, the answer again was zero. In my view, both are signs of sub-optimal teams. Beyond diversity, hiring tuned to key risks and opportunity is very critical and very different. What I mean by diversity here is not in the generic sense of the word. I mean diversity in very specific dimensions of hiring, which from our experience has shown the highest yield of the high-innovation teams that we are looking for are at Khosla Ventures:

- Diversity of the team's problem-solving portfolio, ensuring that the potential failures are spotted early on and that solutions are arrived at faster
- Diversity of the team's industry experience, ensuring that the team deeply and comprehensively understands all of the rules and requirements of the field
- Diversity of the team's creativity, ensuring not only a culture of livelier conversations and brainstorming sessions, but also an atmosphere of welcome dynamic innovation.
- Diversity of age, ensuring the mixing of old and new ideas, methods and mindsets, ideally between multiple generations of engineers

[2]For more on how new hires affect the existing team, see our paper, The Art, Science, and Labor of Recruiting.

This does not represent an exhaustive list of what diversity is, but it offers four readily identifiable categories that the team leaders can target in their hiring process. Ultimately, whenever startups wish to hire to reduce risks, they are inherently discussing inviting and fostering diversity within their team because the risk already implies an expertise not currently present. Alternatively, the expertise might be present, but the risk is so important that it might require additional (different!) expertise from the one already available. The process of gene pool engineering, therefore, is not something akin to an alien procedure — it is the streamlining of what startups do inherently by being startups!

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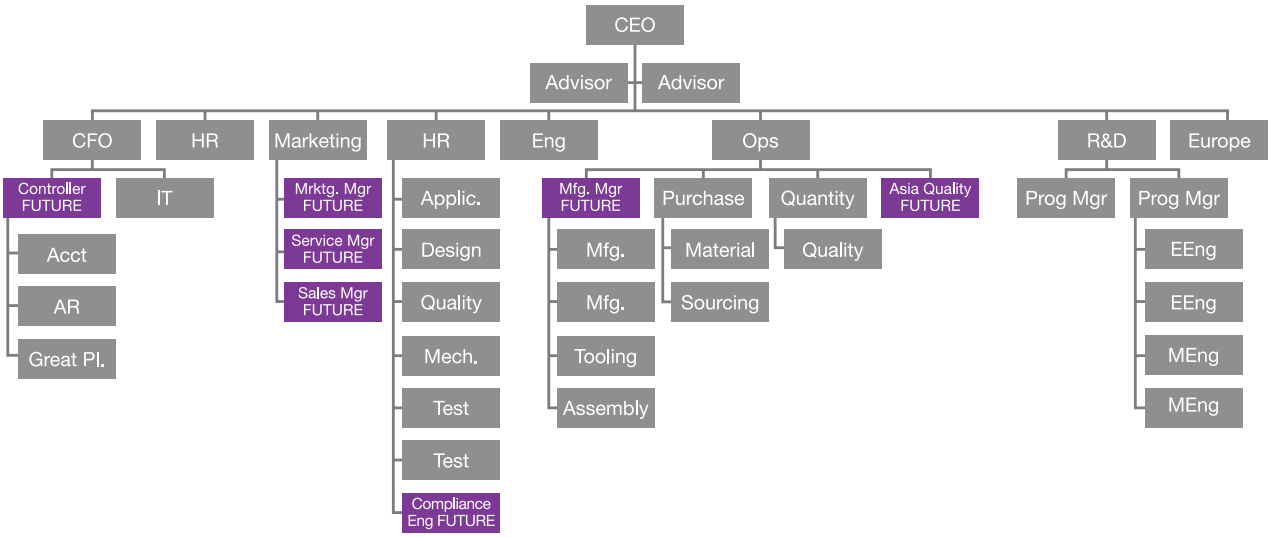
Functional Hiring



Entities structured with the traditional hierarchy often hire reactively, such as when an opening occurs due to attrition or poor employee performance. Consequently, firms facing market environments where change, innovation and rapid evolution take place can rush into a process that ends with a candidate to "fill the job." Not knowing any better, HR managers or recruiters often take a narrow view of the skill set required to best solve the problem. They pick from a pool of prospective employees who come from within the organization or have similar backgrounds to the senior manager. For example, managers of GE heritage gravitate toward GE-trained candidates because of organizational familiarity and preconceived notions about the quality and

familiarity of the ex-employees. Insert nearly any company for GE and the same holds true. This focus on familiar pedigree – but even more importantly the functional requirements (for instance, the need for a manager with "materials science Ph.D. or substitute "consumer marketing" and 10 years of experience managing materials science projects, etc,) result in the employee search space lacking critical levels of diversity in both experience and thinking. The Center for Creative Leadership has shown that in nearly one in four recruiting cases within Fortune 500 companies, the candidate selected was the only candidate considered.[3] Unfortunately, recruiting from the same organization enhances groupthink, furthers bureaucracy and limits risk-taking. It also can create an environment where problems that could have been avoided were missed due to homogenous thinking and adoption of a rigid problem-solving methodology. GE's fabled six sigma process "DMAIC" is a highly successful set of analytic tools but rarely encourages outside-of-the-box thinking.

Focus on familiar pedigree — but even more importantly the functional requirements result in the employee search space lacking critical levels of diversity in both experience and thinking.

Leaders can be successful in the rigid traditional hierarchy built with functional recruiting but much of the impetus then falls on the leader to ask probing questions and demonstrate flexibility in adopting the best possible solution to a problem. This leader must also encourage a culture of independent perspectives, no repercussions for promoting ideas and a willingness to iterate on solutions as a team. He or she must take great care in keeping the entrepreneurial spirit alive. Traditional recruiting and techniques can be used to encourage and manage innovation. Intuit founder and Chairman, Scott Cook, has described a recent directional change in middle managers as "guiding experimentation" rather than "managing projects".

[3]Fernández-Aráoz, Claudio, Boris Groysberg, and Nitin Nohria. "The Definitive Guide to Recruiting in Good Times and Bad." Harvard Business Review May 2009. Web. <https://hbr.org/2009/05/the-definitive-guide-to-recruiting-in-good-times-and-bad>.

Engineering the Gene Pool

The goal of gene pool engineering is first to create a culture where multiple people engage in problem solving, and team members share best practices from previous organizations and a diverse set of backgrounds for the specific problems being addressed.

The goal of gene pool engineering is first to create a culture where multiple people engage in problem solving, and team members share best practices from previous organizations and a diverse set of backgrounds for the specific problems being addressed. More than this, the hires must not only add strengths, but also help minimize risks through their diverse previous experiences. It is easy to hire to boost a team's strengths without addressing a team's weaknesses. The key goal is to understand all the nuances of an industry and have a full map of all the issues before one starts to disrupt them: what has been done before, what has been tried before, did it work or fail and why. Having a gene pool engineered team for all this past history (both the key requirements and the opportunities as well as failed strategies to meet the requirements) allows one to mix all the industry knowledge with the new ideas the founders usually bring. The resulting diverse "soup of experiences" creates a larger pool of problem-solving ideas beyond better understanding of the industry one wants to disrupt and increases the likelihood that an organization will make superior decisions with respect to the specific innovation it wants to encourage and the risks it wants to manage without "group think or naïve think," both important failure modes. Given, within start-up companies, big technology challenges require multiple iterations and a bit of luck, an agile and diverse organization is critical to problem-solving. The same concept holds for evolving business models that require constant adjustment and new ideas. In essence, we believe management of change, be it innovation, risk management or rapid business conditions change require a new style of recruiting that goes beyond the functional skills of the individual to consideration of team diversity, experience diversity and dynamics. ***Fundamentally we believe that a team can be "precisely engineered" through this "gene pool engineering" process to manage the risks AND to take advantage of opportunities to create disruption without running afoul of key requirements of the industry.***

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The process for gene pool engineering is as follows:

1. Identify the five largest risks in a project, environment or innovation.
2. Define the skill-set and experiences necessary to address those risks
3. For each risk, locate the five Centers of Excellence both inside and outside the industry for that specific risk. A center of excellence could be a company but often one wants people who have solved similar problems in different industries. Which company has solved this kind of problem before independent of whether they are in your industry or not? Try and identify 3 – 5 companies that addressed each risk.
4. List the top three or four experts at each Center of Excellence. Who worked on the problem in the companies you identified in #3? Try and find 3 – 5 names at each of 3 – 5 companies you have identified above. The list then results in a list of up to twenty interesting candidates qualified to address each risk but come from different companies and hopefully different industries.
5. Contact candidates within that "gene pool" for recruiting and hire 2 – 3 people who have diverse backgrounds and are qualified to address each of the risks they are targeted at. In the end, you should have a diverse team TUNED or ENGINEERED to the specific risks your company faces. In addition, hopefully you have engineered in enough diversity to both understand all the solutions to that problem that have already been tried in and outside your industry. Here, it is important to not only get the right skills, but also to get them from different companies, industries, experiences, and ages — along our suggested dimensions of diversity.
6. Repeat the process above for the five largest "opportunities" for upside in the project. Running a startup is not only about combating risks. This is why, either in parallel or after this risk-tuned hiring process, the team leaders should also engage in an opportunity-tuned one. The process remains exactly the same, but the target (opportunity instead of risk) changes. These opportunities could be emerging from inside or outside the team. Internally, the merging of experiences, solutions, and insights could trigger opportunity areas that become apparent only with new hires. Externally, the industry could provide certain vulnerabilities or states that the startup could take advantage of. What could very well happen is that the risk-tuned hiring process gives rise to a team that provides (through the knowledge of industry rules and experiences with products in that industry) opportunities that then become the focus of the next round of recruitment.
7. Keep in mind that ideally, any hire should not only do their "functional job" but should bring enough experiences to know "the kinds of problems others have encountered with this technology" (and those that you might run into), the kinds of solutions that have been tried before and worked or did not work, and additionally, they learn to ask enough questions to make other people in the team better thinkers about their own areas of specialization. In this way, each hire stretches the functional expertise of a team (by adding a skill set that was not present before), but also stretches all of the team members outside of their present comfort zone. If hiring is timed right, this ensures that the 'stretching' happens just as the team was getting settled down, perhaps becoming too comfortable.

To illustrate the concept, we present the team structuring approach applied by ePowersoft — a Khosla Ventures portfolio company in the power semiconductor space.

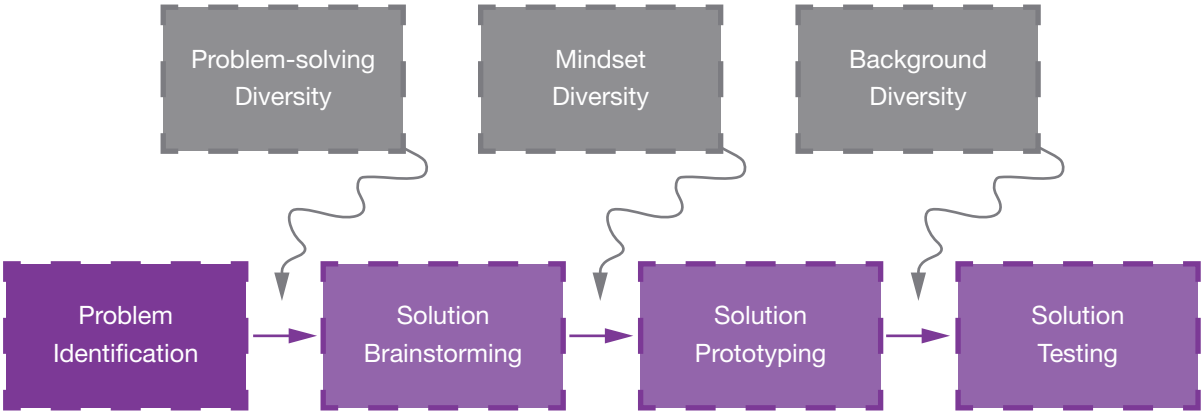
Benefits of Gene Pool Engineering

The goal of startups is to create products that disrupt an established industry with its own rules and product lines. The founders cannot do it alone, so they require a team to help them do both: build the product and disrupt the industry. Most urgently, though, the founders are looking to gain acceptance with their product in the shortest amount of time for the greatest amount of impact. To ensure both, the founders require diversity in their team. Not diversity in the generic sense, but diversity in specific dimensions: age, professional record, academic background, and mindset. By maximizing diversity along these lines and applying it specifically to address identified key risks to the next acceptable product iteration, the team leaders ensure alignment between their first hires and their startup's first challenges. This risk-tuned diversity manifests in the product through the reduction of time, energy, and resources to achieve the first key iterations. What an un-engineered or imprecisely-engineered team might have to learn through product iterations (each of which could take months), a precisely-engineered team could learn through conversations (each of which could take a few minutes). The risk-tuned diversity manifests in the startup's disruption potential by assembling — through the people's previous industry experience — not only a comprehensive outline of the industry rules, but also a comprehensive understanding of their existence, requirements, and rigidity. In this way, the precisely-engineered team does not have to run up against them through inappropriate design or uncomfortable industry discussions. The team can instead steer the startup in the right direction from the get-go. The overarching goal and benefit of gene pool engineering is to mix the professional expertise and industry understanding of the experienced hires with the entrepreneurial energy and innovative ideas of the founders. The result is a startup culture that produces products with higher disruption potential faster while simultaneously opening the startup to opportunity-tuned side hiring.

Mix the professional expertise and industry understanding of the experienced hires with the entrepreneurial energy and innovative ideas of the founders.

Before explaining each step in detail using examples, it is important to understand what the benefits of gene pool engineering are in a more tangible sense. How does the kind of diversity we hire for play out in the innovation process? Let us model the innovation process in a startup with four simple steps: problem identification, solution brainstorming, solution prototyping, and solution testing. The value added — beyond hiring talent tuned to risks and opportunities — we look for from our engineered diversity comes from the diversity of the team (backgrounds), experience (problem-solving portfolios), and dynamics (personalities / mindsets). Diversity in terms of the backgrounds ensures that knowledge from different fields can come together in the

process of solving similar technical problems. Here, it is important to find scientists and engineers not from the same field, but from different fields that utilize similar chemistry or physics or other knowledge bases. This background is not enough, though. Each addition to the team brings also a problem-solving portfolio not necessarily from the field they were trained in. The wider this range of solutions produced, the wider the range of problems encountered. The collective range of problems and solutions engaged by the entire team opens the door to finding potentially new problems and solutions the team has seen in different contexts outside of their current field. Communicating and wrestling with these issues requires myriad yet complementary personalities that can work together in such an environment. Beyond working together, varied ways of thinking trigger broader dialogue that usually inspires never-before-seen possibilities. This — "soup" is the best way to describe it — is the lifeblood of any successful startup.



It is important to clarify the difference between risks and components of any given technology venture. Building a computer system requires software and hardware, for example. Within hardware, there might be design, manufacturing, and materials components, but not necessarily risks. Proper risk identification is the key to this process, given the founding team, current technology, and best practices, certain things like design and manufacturing might not be risky at all. It could be, however, that the materials component (say heat management) that has never been applied before in this space might be extremely risky. Therefore, recruitment tuned to risk minimization leads to hiring specifically to counter risks in heat management versus "hiring to handle manufacturing" which is more traditional. It is important to understand how the hiring process should complement the role of the innovator.

> *The innovator tends to be the naive risk-taker, who develops and pursues his idea for disruption.*

The innovator tends to be the naive risk-taker, who develops and pursues his idea for disruption. Some of the first hires should, therefore, bring in a comprehensive understanding of the to-be-disrupted industry, its

requirements, and history of past failed disruption. This way, the innovator's idea can be leveraged fully against the industry biases to maximize its disruption potential. In outlining the process below, we consider a venture that is risky in multiple components, so that the example is as comprehensive as possible.

Step #1: Identify the five largest risks

In "Risk Analysis for Entrepreneurs and Venture Capitalists," the Khosla Venture team outlines a process for systematically identifying risky components and their multiple failure modes. Risks fall into the category of technical risk, where the failure of interdependent modules could result in the collapse of the product as a whole, or general business risk or marketing risk, which encompasses everything else that is required to take the product to market. For gene pool engineering, each of the five mission-critical risks should be outlined by the team lead. In the case of ePowersoft, semiconductor device engineering (R1), materials development and deposition (R2), scaling manufacturing processes to multiple tools (R3), device packaging (R4), and plant operations (R5) represent the largest risk items. ePowersoft is an early stage company so most of the risks were technical and operational. The products fit into existing markets, so marketing to current requirements was not a key risk early on. One can imagine at a later stage, once the technology breakthrough has been established, adding "marketing to new markets" or "creating new markets" for this "power electronics component" as a key opportunity (or a risk if existing markets for this component were not accessible for some reason). One would then gene pool engineer to such additional risks or opportunities. Though gene pool engineering for risks is essential, it pays to also engineer the gene pool for additional "upside opportunities" the company may have. Keep in mind that Twitter, Facebook and Google were not "existing markets" but were markets created by the startup. Sun, Cisco, AOL were not existing markets either. Finding the team that can create the option of adjacent or new markets or innovative product approaches (Salesforce.com software as a service instead of a product) to old markets or adjacent markets (AirBnB, a market adjacent to hotels) to current markets is often the unexpected but massive payoff of engineering the right team.

Key Risks Facing Our Company

Risk	Description	Critical Level
R1: Device Engineering	Designing semiconductor devices and fabrication process flows, layout, circuit design models	9
R2: Materials Selection	Material selection to achieve: insulation, surface passivation, electrical contacts, thermal properties, electrical properties, protection from environment (e.g. humidity.)	5
R3: Scaling	Plan for miniaturization (e.g. CMOS Scaling) through scaling rules or in the case of power electronics that the device geometry can be scaled up from prototypes to higher power levels	7
R4: Packaging	Protection to prevent damage from handling, shock, vibration, humidity, environment, contaminants, electrostatics, subsequent fabrication steps	8
R5: Operations	fabrication and manufacturing — yield, staffing, tooling, cycle, capacity optimization	3

Five technical risks = success or failure

Step #2: Define the skill-set necessary to address those risks

To address the key risks within the company, the main tool available to a CEO or manager is the hiring of experts who have successfully solved similar problems in the past. In the example above, the mission critical risk involves the engineering of electronic devices, specifically next generation diodes and transistors. By bringing on experts who have experience in designing, fabricating, and testing these devices, the organization increases the likelihood that a new device based on the company's unique technology can successfully be implemented at scale.

The company should consider hiring multiple engineers with diverse backgrounds to address a key risk area, especially if it is critical to success. The principle guiding this step is the collection of conventional wisdom and experiences across multiple companies and letting them collide in healthy discussions. The more varied the company background of the engineers, the more failures and solutions at disruption they will have seen by the time they all sit around their lunch table in their startup environment. At the same time, each hire must add to this 'specialized diversity,' while also fulfilling the functional needs of the organization (it makes no sense to have a diverse team of all vice presidents, for example). In this case, because the other four technical risks are interwoven with R1 (device engineering), we chose to hire a Vice President of Engineering with

expertise in that field to oversee the entire project and three additional device engineers with competencies in the major facets of device engineering. For example, an engineer might be a world leader in the computer simulation aspect of semiconductors but weaker in translating the simulations to actual fabrication techniques. Bringing on three experts in this category allows us to balance the total skill-set across the group. It also lets ideas collide from different backgrounds and hopefully get resolved as more compelling and more innovative solutions.

The more varied the company background of the engineers, the more failures and solutions at disruption they will have seen

For ePowersoft, we also consciously built diversity of thought in the devices team by mixing more experienced industry luminaries with younger engineers. While the more inexperienced team members lack the breadth of knowledge provided by the veterans, they can offer a corresponding lack of industry biases and a fresh perspective on a problem. “Been there” or “tried that” can save lots of effort by eliminating experiments that are already known to “not work,” but can also limit experimentation and a bias towards conventional wisdom. A mix of collecting all the mistakes and learnings that have already been made in other organizations (ideally a diverse set of organizations in diverse industries) can combine with the younger folks with bright ideas and lack of institutional bias. Hence, the existing belief systems can, in our view, create a powerful mix to solve new and unique problems. The combination helps ensure we explore the full solution space.

The more inexperienced team members lack the breadth of knowledge provided by the veterans, they can offer a corresponding lack of industry biases and a fresh perspective on a problem.

In addition to mixing the age groups, we also sought to mix the backgrounds of the engineers while keeping their proficiencies and competencies complementary. Specifically, we looked for engineers in areas with solar cells, LEDs, transistors, and others. This is because engineers working with these devices employ similar physics and speak a common language. Yet, by being from different fields, they cover a wider set of industries and problems encountered in each. This intersection of multiplicity of application and similarity of language is one of the key goals of gene pool engineering.

Step #3: For each risk, locate the Centers of Excellence

The third step of gene pool engineering involves identifying the organizations across academia, the corporate world, and any other top institutions that make use of the relevant skill sets for a particular risk. The best skill set

does not have to be readily obvious in that center's field, though. If an electronics startup is looking for a materials scientist, a center of excellence might be a world-renown company that supplies the automotive industry with casings. This could be the case because maybe scientists in this company work with the widest range of materials necessary for our venture and because they pick up design and manufacturing skills from that particular corporate environment. This list should include the traditional targets of direct competitors, bleeding edge public and private R&D labs, and divisions within large multinational corporations. The team should also identify adjacent sectors that may have seemingly little overlap at the end-product level, but share similar discipline in the product development process.

Also identify adjacent sectors that may have seemingly little overlap at the end-product level, but share similar discipline in the product development process.

Find out who in each company worked on the project and made contributions or gained a lot of experience on what not to do or how to solve the problem. That means tracking down details of the relevant project or technology within each of these companies. What was done? By whom? Names below are disguised:

Headhunting to Key Risks

Risk	Heads	Target Institutions	Names	Priority
R1: Device Engineering	1 Project Manager	Intel	John Smith, PhD	1
			Gustav Kott, PhD	1
			Joe Black, MEng	3
		Teledyne	Dan Horrowitz, PhD	2
			Benjamin Kiel	2
		Cree	Ron Niels	2
			Michelle Carr, PhD	1
			Russell Huang	4
	3 Lead Technologists	First Solar	Pedro Castanella, PhD	1
			Sebastian Lambert	4
		Raytheon	George Tang	3
			Matt Hart, PhD	2
		IBM	Ilya Korotkov	1
			Pradeep Singh	4
			Hugh McKnight, PhD	5

In our ePowersoft example, we have identified experts in the traditional recruiting targets including direct competitors like Cree and firms with application expertise like Raytheon. We also chose to approach experts in non-obvious, adjacent industries like solar. First Solar's design rigor, focus on cost-effective manufacturing, and history of meeting deliverables are directly applicable to electronic devices. This led us to add several high priority candidates from First Solar to the gene pool. Ultimately, the resulting heterogeneity of thought from an engineering team with diverse backgrounds encourages the exchange of ideas and evolution of new cross-bred ideas. Mixing of genes is a powerful technique. The technique draws its power from the optimization of diversity, though, which is why the diversity we look for (age, industry experience, problem-solving portfolio, and creativity) are critical. It is not that we hire for any generic kind of diversity. Rather, we purposefully hire for specialized diversity.

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Gene Pool Diversity

Risk	Heads	Target Institutions	Names	Priority
R1: Device Engineering	1 Project Manager	Intel	John Smith, PhD	1
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			Benjamin Kiel	2
		Cree	Ron Niels	2
			Michelle Carr, PhD	1
			Russell Huang	4
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			Sebastian Lambert	4
		Raytheon	George Tang	3
			Matt Hart, PhD	2
		IBM	Ilya Korotkov	1
			Pradeep Singh	4
			Hugh McKnight, PhD	5

Look Outside the Company / Sector

Step #4: List the top three or more experts at each Center of Excellence with relevant skill sets and recruit them

Recruiters will often place a cursory "feeler" out to one or two individuals within an organization before checking the box and moving on to another firm. This customary practice reveals two flaws that our gene pool engineering approach addresses. First, we recommend that senior team members who thoroughly understand the scope of the problem and not placement agents or junior team members drive the activity. Given that recruiting substantially informs a start-up company's plan, senior leaders should view the process as an opportunity to learn and refine the business plan. Going deep into the risks and various candidates' views of the risks (and identification of additional risks: "did you think about xxx? That might happen?") can materially improve the understanding of your true risks and opportunities and tell you a lot about what the candidate might contribute to your team. Senior management should spend a lot of time on these tasks and take recruiting as an opportunity to get lots of outside views. Getting opinions, especially skeptical ones, are important and they should be considered even if they are eventually rejected.

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Second, hiring managers should expect to engage in multiple informational conversations with several candidates in the target Center of Excellence. This enables the company to triangulate on the A+ players[4] through multiple data-points and widens the network to unearth candidates that might not have been previously visible. Applying more rigor in this search and screening process has the added benefits of providing high quality, non-biased external references to final candidates in the pipeline and creating a broad database for future hires or backups. However, on the latter point, startup teams must remember that maintaining organizational diversity is critical to establishing a successful team. In fact, if a recruiting process does not improve understanding of the risks and opportunities in an area being recruited for, it is likely that the recruiting manager has not been looking broadly enough or with an open enough mind. I often say in this process persistence is key in the face of good candidates that are not looking when approached through this process. To me, when recruiting, a "no interest" is a "maybe" and a "maybe" is a yes!

Step #5: Pursuing and recruiting candidates within that "gene pool" for recruiting

While the final mix of employees in the gene pool will depend on exogenous factors such as relocation and compensation, a manager has the paintbrush to structure a team that mixes varying educational and functional backgrounds, domain expertise, age, and implementation skill.

[4]Khosla, Vinod. "The Art, Science and Labor of Recruiting." Khosla Ventures. 30 Sept. 2011. Web. <http://www.khoslaventures.com/the-art-science-and-labor-of-recruiting>.

Risk	Critical Level	Name	Institution	Notes
R1: Device Engineering	9	John Smith, PhD	Intel	Need +1 hire
		Ron Niels	Cree	
R2: Materials Selection	5	Ernest Volkner	Philips	A+
R3: Scaling	7	Alan Rich	MIT	A
R4: Packaging	8	Troy Mills	Infineon	B+
				Need +1 hire
R5: Operations	3	Jay Shah	First Solar	A+

By addressing a company's largest risk factors with proven problem solvers and creating a team that welcomes the exchange of ideas and best practices and experience from different areas, a team lead is engineering an organization that has the highest probability of mitigating risk and taking advantage of upside opportunities in the face of change, innovation, risk and lack of clarity into the future. Often the best opportunity may not be the current plan, but an "adjacent possible" solution that offers more room for an innovative approach.[5] In addition the team will be best qualified to respond as the environment changes. In our ePowersoft example, the mix of high profile industry luminaries from market leading firms, junior engineers who represent the best research minds in academia, and experts from adjacent industries has significantly improved the probability of a successful technology innovation. Other risks like marketing and product or segment selection remain and are the next phase of risks, opportunities and hiring. It is important to remember that risk-tuned hiring is not enough! Every startup must be actively seeking out opportunities, which means actively pursuing the hires that find and exploit those opportunities.

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Repeating the same process of gene pool engineering for the downsides (risks) and upsides (opportunities) of any given industry ensures that the startup is evolving its teams and products in both directions.

[5]Khosla, Vinod. "The Innovator's Ecosystem." Khosla Ventures. 1 Dec. 2011. Web. <http://www.khoslaventures.com/the-innovators-ecosystem-2>.

Conclusions

In essence, management for environments with rapid change or where new rules are being added to the competitive landscape are very different from management for relatively stable environments where the rules of engagement stay relatively consistent over time and old institutional learning, applied with discipline and process is the right approach.

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And each type of environment requires its own unique approach beyond building the precisely engineered teams. When venture capitalists perform portfolio assessments, a strong correlation emerges between the strength of the team and confidence in the likelihood of a positive outcome. But beyond strength of the team attention is seldom paid to the engineering of the team to the specific risks and opportunities that a startup has. The goal here is to make the platitude of “hire great people” a more actionable and quantifiable process. Great ideas suffering from poor execution can kill companies, while less spectacular ideas coupled with phenomenal teams can quickly swing a company from troubled to a success. But beyond this correlation, our experience says engineering the gene pool to the task at hand may be just as important if not more so than pure excellence. Consequently, managers should focus on building an organization by collecting a diversity of talent vs. simply hiring to a functional plan or budget. While there are multiple mainstream approaches to building great teams through functional recruiting, the gene pool engineering construct can create the entrepreneurial, problem-solving and rapidly evolving culture, goals and plans that have become the hallmark of many Silicon Valley success stories. Leaders and managers should act as shepherds rather than sergeants, and focus on applying this approach to mitigate risk and accelerate new opportunities for a rapidly growing business.

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