Selecting Technology and Creating $30 -300 Billion in Value for the US Economy.

By Gary Howorth, Founder Energy-Redefined

Introduction

In a recent article written in the Sunday New York Times **1** , attention was drawn to the performance of the Houston Rockets basketball team and one man in particular Shane Battier. I'm no fan of the team, but Shane Battier has one of the worst records in basketball when viewed from the usual statistics point of view. But why is he so important?

The article in essence makes three important points. That simple ranking methods or indices like balanced scorecards don't really work in predicting the real value of Shane Battier. In addition they give no real measure of ultimate team performance**2**. And lastly he brings real value to the team in some other way. We all inherently believe that the team has more value than the sum of the parts and some seemingly invaluable components are key to network or team success. This is the crux of this paper. But how do we value and identify these important components, technologies and or team players? This paper will essentially show:

- We have a methodology that addresses these issues,
- Places a value on the team, portfolio or network of players and can highlight areas of value extraction
- Can apply this to better focusing either company, VC or government spending on technology programs
- Have built prototypes that have shown how to extract this value and have identified research avenues that would have otherwise been missed
- It is flexible and can be used across a number of industries, but we will concentrate on technology investments in the energy industry, as this is our area of expertise.
- That network structure and policies drastically affect the outcomes. Understanding these is important to optimize results
- That the interaction of the players, structure and policies are highly non linear and mean that the myriad of sophisticated but linear models in the market today may be providing misleading conclusions.

[1] http://www.nytimes.com/2009/02/15/magazine/15Battier-t.html

[2] Another good example of this would be the multi million dollar soccer player who once transferred underperforms

So why is this so important Now?

Recent changes in government positions and a focus on new technologies and will divert funds to pressing energy and climate change issues and firms addressing them. Beyond creating jobs, government investment in these technology fields, holds the promise of laying a lasting foundation for more business innovation and efficiency, while helping to create new industries. The appeal of these kinds of investments is that you not only get the simulative effect but also build a platform for productivity gains and long-term growth. If applied in the right way this approach could create some 20-300 billion$ of value to the US economy, including under the right conditions some ~1-10 million jobs[3]. But current approaches based on current expert ranking methods used in organizations like SBIR etc could miss much of this value

In the same way as our basketball example, technology sponsors whether it be government or private investors have been struggling with a similar but a related issue in Research and Development/technology[4]. That of how to best spend taxpayers or other funds more effectively. Many government audits and reports have been written about the inadequacy of the existing systems to select "winners". These solutions typically are focused on complicated indices with "expert input".

We believe like our basketball example they take no account of the team or network effects or other spin offs to the investors whether they be government or private investors. In addition the R & D experts:

- Typically overvalue their technology (but not in an malicious way)
- Focus on and around their own areas of expertise and do not necessarily look outside their scope
- Tend to band together with other like experts or social norms[5]

The resulting incremental approach is good in formative or new industries such as biotechnology as benefits from this focused approach can be large. The traditional experience curve tells us this. Large gains with exponentially declining returns through time. The "big" and innovative breakthroughs of course will come from outside the Industry, but only if they are allowed to flourish.

So what does this mean? Participants who look inward, will reap incremental gains. Those that look outward and are more open, may gain much more. But incumbents within industry have a poor track record of allowing these external ideas to their industry to take hold. It presents risk to them in many ways.[6] But good ideas, which are not adopted, ultimately have no value.
So an analysis of these potential "blockers" or gatekeepers and methods or policies to change the technology and Industry landscape are incredibly important and provide one key to unlocking value.

After reading this paper you may be thinking this is sort of like social networking. Well you would be right. So surely we need to have as many contacts as possible to gain as many new friends ideas as

[3] http://www.nytimes.com/2009/01/26/technology/26techjobs.html 900,000 jobs per $30 billion.
[4] I will use R & D and Technology interchangeably here in this article.
[5] We don't believe that this is contentious as this is well documented in many research papers
[6] Risks can be viewed in many dimensions including ultimately an impact on the incumbents job.

possible. I'm sure you have friends who have social network sites like "linked in", "Facebook" with 30 -50 contacts and others that have over a 2000. Unfortunately there is a cost to maintaining links either in time, money or energy, which many of us tend to forget. Some of the links are valuable and others are not. The evidence from a number of recent studies in a number of different [7] industries clearly shows that there is an optimum level and type of contacts required. It depends on the network structure and its underlying dynamics – which by the way, changes through time.

It is however possible to capture many of these network and spin off values, and to manage and extract value from them.

But we also believe that this approach can provided a myriad of other benefits including but not limited to:

- Better and more focused University programs/Education – particularly in science
- Takes account of Government priorities/requirements including climate change initiatives and job creation
- Helps in the deployment and diffusion of new technologies and the identification of blockers
- Creates value to society as a whole (including private investors)
- Identifies additional value in addition to the more conventional approaches. This helps lowers risk to potential investors, allowing private or VC investors to enter earlier in the development cycle. We believe that this will ultimately help in the faster diffusion and adoption of technologies.

Why the need for a better system

Although we have discussed this at some length above, we would add that many of the current methodologies either use a modified experience curve approach or has focused on patent analysis. This is valuable work but doesn't reflect the network or team nature of this problem. Neither does it recognize in any sophisticated way the impact that policy, gatekeepers and other industries technologies interact and react to various stimuli and responses. They are not particularly dynamic.

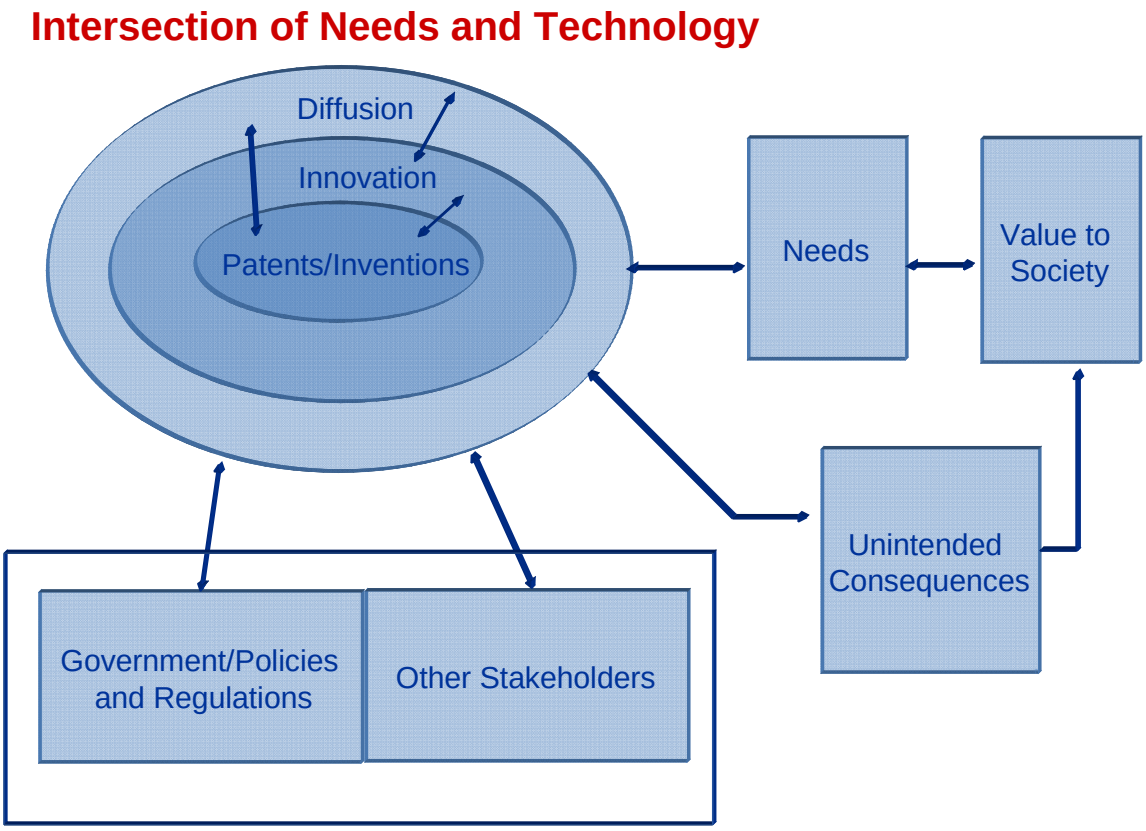
How can we do this?

Over a number of years whilst building various components, we have realized that by putting together various databases and approaches that we can get a better handle on how technologies might evolve, interact and provide value. We have used this approach recently to provide a roadmap for technology development within an emerging country and a similar approach to help a company extract value using a network or spin off approach. Value, far in excess of the conventional individual asset approach.

Most technologists use a tinkering approach to improve their process. At its simplest, technology is both impacted on and by its environment. Technology can change the environment in the longer run and be changed by it. We believe that to be successful, technological progress, needs to be more or less correlated with its environment or landscape. This landscape is shaped by government, industry

[7] You can also liken this to an option. Options have costs , so having many options costs more.

and other stakeholders in varying proportions. So the intersection of technologies with requirements or needs provides opportunities for these technologies. But what are they?



By modeling these intersections in a network and the dynamic process in play we have represented in a more realistic way the true value to society of technology focus. We have brought together a number of approaches that we have been developing over a number of years to capture:

- Technology evolution at the component level
- Modeled the interactions between technologies
- Factored in political and power base issues – ie who will support and who will block
- Valued them
- Built multi –level networks of interaction

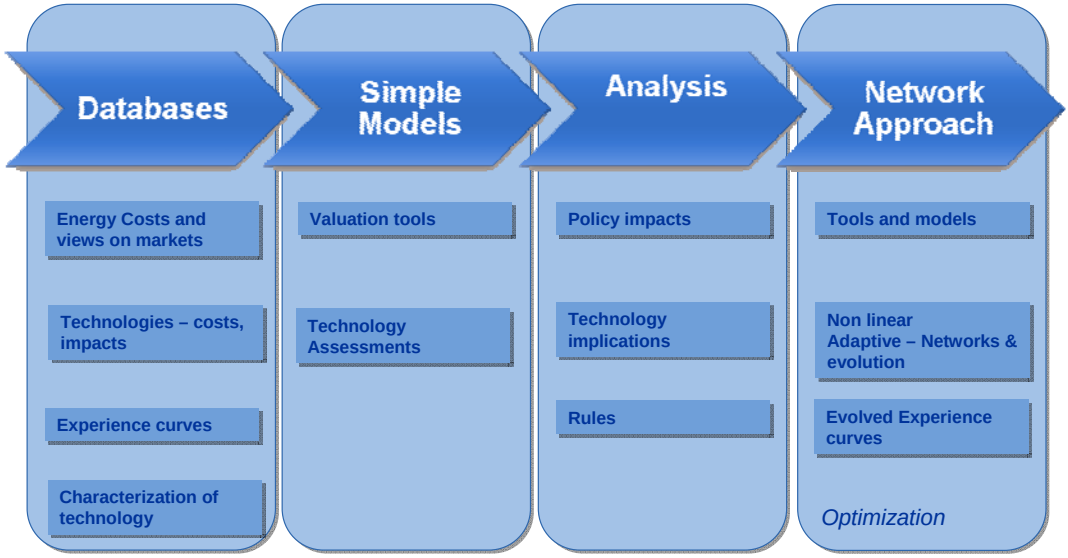
This has been built on a "onion based model" starting with underlying data and databases and finishing with a multilevel interactive process.

Databases

We have started to build a comprehensive database of technologies from both within and without the Industry [8]ie technologies that could impact even in a small way the industries under analysis. This includes data on costs, production output, efficiencies and potential benefits in terms of cashflows and jobs etc.

[8] In this case the energy industry

Methodology –



Models

We have started to build a suite of valuation models (including carbon and other effects) to help us evaluate technologies on a stand-alone basis. This is difficult to perform without a good understanding of how the industry operates and potential impacts on the industry. In addition we have had to develop a better approach to comprehending how technologies evolve and in what direction.[9] This is important in the context of understanding the potential linkages to other technologies. Our approach treats the technology investor essentially as an agent. An agent that can chose the direction in which it wants to grow, based on some logical behavior and selection process. Incentives from governments can change this behavior.

But these agents are interconnected with one another and evolve with one another.

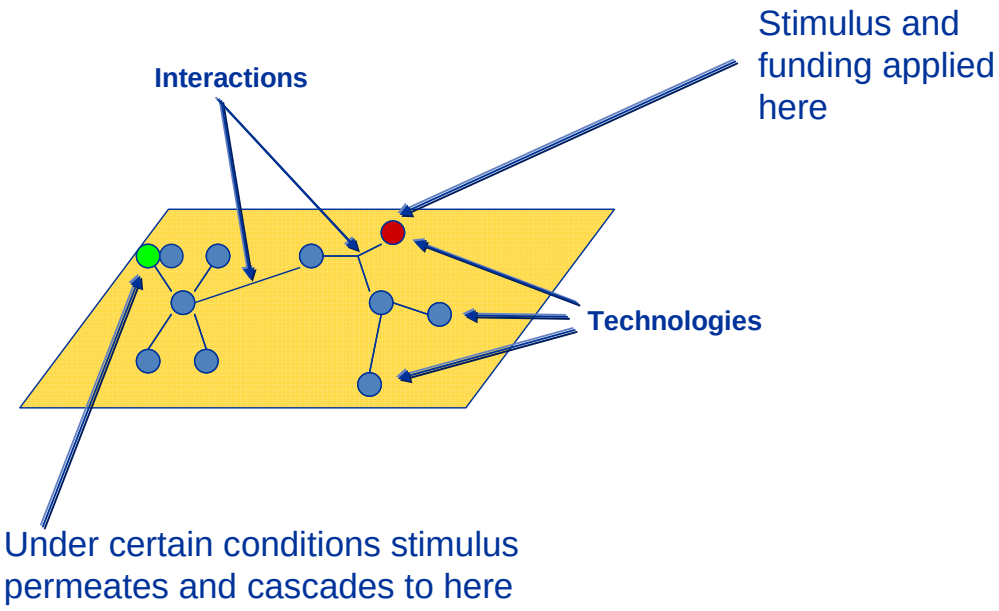
Network Value and identifying Key Areas of Focus

By integrating these components we have the basis for modeling technologies and "valuing" them on a "stand alone basis, but how do we put all this together to extract value in a network?

[9] Our methodology takes account of some 40-50 potential improvements in the current state of the technology .

Let's consider a network of technologies represented in the figure below. The linkages represent potential benefits that could flow to other technologies if they are successful. The links are directional. Success in one or more of the technologies could cascade or permeate through the network. Our models allow us to simulate this. If we put values on these links to society or to investors we have a way to value the network. If we remove a link or a node (technology) then we can revalue the network. The difference between the value of the network with and without the node represents the value of the node or link. Note in the case of the basketball player this is the better way to value his contribution. Simple but of course the devil is in the detail.

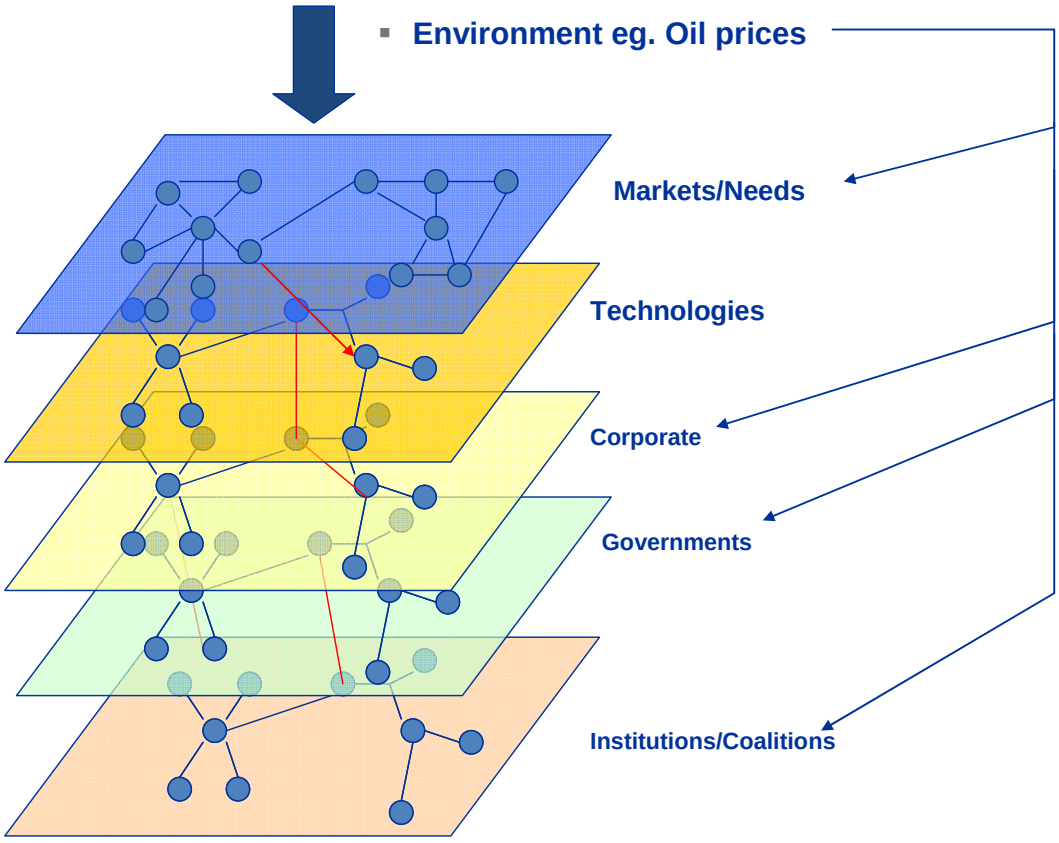
Technological Interactions



But this only tells one part of the story. There are other interactions that need to be considered. They include, amongst other things:

- Market impacts
- Carbon and green energy
- Government and social needs and issues
- Company positions and behaviors

Networks Interact and Change due to other Interactions



To cut a long story short this is what we have done. We have built a multi level non linear simulation model that starts to address these issues.

Summary

So this methodology essentially captures a number of facets that we believe is important to understand in creating real value in the technology business.

It uses a combination of a variety of approaches and could provide multiple benefits including:

- Education
- Jobs
- Better technology focus to meet agreed goals
- Help reduce climate emissions
- Portfolio management
- Identifies
  - network value of individual technologies
  - blockers
  - technology opportunities - eg strategic alliances

Why us

- Expertise. We have been working on these components for 5+ years and have a through understanding of our industry
- Commercially realistic
- Developed a methodology that can create value.

If you would like to know more contact Gary Howorth at gary.howorth@energy-redefined.com

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