



What makes the difference between an interesting invention and a disruptive innovation?

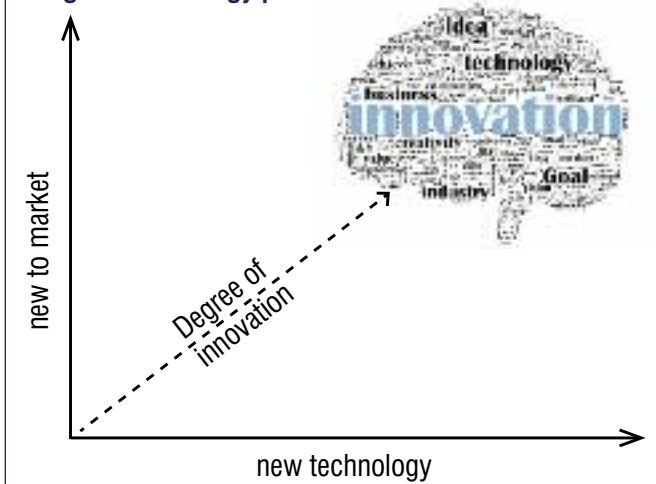
“Levotan X-Biomer INSITU” – a real innovation in the leather industry

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The five stages of the fundamental “innovation equation”

Today we commonly hear the term “innovation”, however, all too often the product and/or service delivered does not justify this classification. A true innovation is far more than just an incremental, evolutionary improvement. It must be really new, disruptive and game changing, a revolutionary step forward. What does it require, and what are the important features for such an innovation? In science, research and development projects are classified in a portfolio as follows:

Image 1: technology portfolio



As a product and/or service is increasingly new to a market (Y-scale), and likewise the technology is increasingly unknown to an operation (X-scale), the more innovative such a product and/or service is. The zone in the right upper corner of the portfolio (*image 1*) Tony Covington⁽¹⁾ called the revolutionary area. In this article, the main evolutionary elements, which could lead to such a revolutionary innovation, are analysed and described as a new innovative leather technology, which fulfills all these elements and should have the potential to be placed in the right upper zone.

An idea in a lab, no matter how ingenious alone is not enough to qualify as an innovation; there have been countless brilliant ideas in the past, but many of these finally didn't lead to a successful game change in the market. Many reasons can be cited for this; a successful launch of an innovation needs to overcome so many hurdles, commercial and technical hurdles as well as emotional ones: e.g. breaking with traditions; fear of failure and an undetermined future, or loss of control, no time to solve new problems

Image 2: “implementation of an innovation” cartoon



“Don’t bother me with new ideas, I’ve got a battle to fight!”

which weren't there before, as nicely pictured in the cartoon (*image 2*).

The detailed analysis of an evolution process of an innovation, which successfully made it to the market, always shows a clustering of this process into five important elements:

1. Intuition + 2. Inspiration + 3. Idea + 4. Implementation + 5. Incentive = Innovation

All these five elements in the equation have to be somehow completed to make an innovation succeed. The entire process from the start of the equation to the end can take years and even decades. During this process the innovative power builds up like a tsunami wave, and at some point of time it has the momentum for a real, disruptive breakthrough in the market.

Let's further define the 5 “i” steps of this equation:

Step 1 - the intuition: this is the base for any innovation, a fundamental requirement, which is necessary to generate the 'long breath' lasting for a disruptive change. There needs to be a clear mindset, a vision for something really new, which has the ultimate power to change a robust tradition. Although it is not fully defined how a technical solution could make this vision possible at that point of time, the conceptual change must be already clearly defined and the inventor has to be 100% convinced that it can be true.

Step 2 - the inspiration: Once there is such a vision for a game change there is a need for inspiration; this could be single developments or smaller innovations around the theme of this vision. They should feed the thinking of the inventors, generate creativity to design new solutions and opportunities.



Step 3 - the genius idea: the important momentum of initiation in the innovative development process; this could be something very easy, but brilliant in terms of outcome. Its generation normally requires out-of-the-box thinking and creative freedom driven by the basic intuition and the inspiration of steps 1 and 2.

Step 4 - the implementation: normally this is the most difficult step in the process. It is the transformation of the idea into reality. It requires courage, optimism, bold partners with head, heart and guts for the new idea, as well as the willingness and lots of patience for making a change possible. Often the inventor has to go through a long phase of disappointment. It is said, that Edison had to overcome 9,000 failed trials, until he finally succeeded with his brilliant idea of a bulb, which he had envisioned already from the beginning. After the 1000th failed trial a student had asked him: "Have we now failed?" He answered: "No, we just know 1,000 ways which do not work."

Step 5 - the incentive: this is the most underestimated, final step in the process and the reason why so many brilliant and innovative ideas failed to finally become a true innovation. A true innovation can be called only an innovation if the market cheers "Hurrah". Every successful launch needs the economics of a smart business model and a win-win incentive for both business partners: the supplier and the customer. The customer/user should be enabled to do and/or achieve something that wasn't possible before, and the inventor needs to get an adequate return on the investment. As more new business opportunities are coming up in conjunction with this innovative approach, this increases the chances for success.

Examples for true innovation:

One of the biggest innovations of the last decade is the launch of smart phones and tablets, and it is a perfect example to demonstrate the truths of this 5-step equation:

The basic intuition behind this innovation was the visionary thinking of Steve Jobs and Bill Gates about personal computers and mobile phones back in the 1980s. Several single breakthrough technical developments like the implementation of the mouse pad, desk top publishing,

"i" step	criteria	communications technology	tanning technology
1	intuition	vision / mindset	personal, mobile computers and communication
2	inspiration	many single developments	miniaturisation, wireless internet and phones, touch screen, tablet PC
3	idea	genius	combination of all in one device; mobile phone with touch screen, internet connection, music and email function
4	implementation	new /	development of iPod/iPhone/iPad high tech
5	incentive	attractive business case	iTunes business model, app industry, messages service in Asian languages
= innovation		disruptive	smartphone
			X-Biomer INSITU

miniaturisations, storage capacity improvement, data speed, etc. led to the necessary inspiration for Steve Jobs to make it work. The main idea of the iPhone-innovation finally was nothing more than just a genius combination out of the cell phone, a digital tablet, the iPod and the internet. At that point in time when Steve Jobs launched the iPhone, cell phones had been on the market already for 15 years, digital tablets for nearly 10 years, wireless internet and touch screen (iPod) items for five years; what was the reason for such a success story? The true success was that finally the point of power for a change was reached: a single solution in one high performance device with a futuristic, technical design. Most important, step #5: this combined with a perfect business model all at once: the iTunes app/software and music store.

It might look somewhat pretentious to compare a development like this with something going on in the leather industry right now. However, the "Levotan X-Biomer INSITU" storyline – an "on-time" and "on-demand" production of X-Biomer retanning chemicals out of tannery by-product(s) in a fully automated operating unit in a tannery - has the potential for a game changing innovation step; if you think it through, all the above mentioned elements of a disruptive potential are fulfilled.

Step 1) In the year 2000 UNIDO came up with a mass balance of leather processing⁽²⁾. In this study it was calculated that for the production of 1kg of crust leather; depending on leather type about 4-6kg of by-products and waste are generated. About 70% of this amount is protein based by-products: fleshings, trimmings, shavings and unused splits. As around 85% of the

leather produced today is based on chrome tanning the majority of the by-products, of course, contain chromium as well. It is not sustainable that any of these amounts end up as waste. The vision has to be zero waste and to find a way to transform the chrome-containing collagen by-products of leather production into something valuable and to generate additional business opportunities for tanners and chemical suppliers. This needs to be the overriding principle, and today this is not implemented globally to an acceptable extent.

Step 2) The inspiration for this concept was the many interesting publications of so many researchers around the world and their various ideas of what can be done with the protein by-products. In addition, for us, the inspiration was the successful development and launch of Levotan X-Biomer, where leather by-products are used as raw material.

Step 3) Inspired by the good technical performance of the products as well as many other sustainability advantages compared to traditional retanning chemicals, such as low salt/TDS, better BOD, lower VOC, etc., the spark for the "X-Biomer INSITU" innovation idea was, again, a combination of several things. Instead of bringing the shavings from a tannery to the chemical plant to produce the Levotan X-Biomer chemistry in a central manufacturing unit, and transporting the chemicals back to the tannery, just do it the other way around, and install a mobile chemical production unit into a tannery. The innovative concept now is to convert the collagen-based by-products into valuable retanning chemicals directly, where the by-products are generated and when



The pilot plant during testing phase.

the retanning chemicals are needed: “on site” and “on demand” = “in situ”.

Step 4) This simple idea has been turned into a project called “resource efficient manufacturing of retanning chemicals”, a collaboration between Lanxess, Invite, Heller-Leder, and sponsored by the German government⁽³⁾. It has now entered the implementation phase, the important and crucial step 4 as described before. It is the first mobile, fully automated, conversion plant for converting shavings into retanning chemicals. It has been constructed by Lanxess and Invite, and is now going to be tested at Heller-Leder tannery in Germany.

The innovative production concept: the photograph above shows the completed pilot plant; 15 tons of stainless steel, 25 electric motors, hundreds of single functional units have been fitted into two 20-foot container frames, and are process controlled from one single central unit. Despite the complex engineering, its operation is quite simple. Shavings or carbohydrates will be continuously fed into a closed system which includes a chemical reaction vessel where they are converted into a hydrolysate with a customised molecular weight distribution. In a second production step, of the patent pending process, an exothermic polymerisation of a mixture of carbohydrate-based hydrolysate, protein-based hydrolysate and a monomer generates the final Levotan X-Biomer product(s). Based on the ratios of the mixture for the polymer reaction and the right process conditions, such as pressure, temperature, pH and reaction time, several types of Levotan X-Biomer product with different characteristics can be produced, all “INSITU” and fully automated to the specific requirements of a tanner. The necessary raw materials such as sulphuric acid, sodium hydroxide and monomer are

connected in standard Intermediate Bulk Containers (IBCs) to the operating unit. The full process generates zero emissions, all raw materials are converted into the final Levotan X-Biomer. Production step 1 and 2 can be run in parallel, so every couple of hours approximately a tonne of shavings gets converted into an IBC of fresh Levotan X-Biomer. The operator, the tanner in this instance, only has to ensure that there is enough raw material available, otherwise they need only to push a button and everything else runs automatically.

Step 5) This is still to be developed. The conceptual plan is that savings, through transportation of shavings and final products, will at least compensate for higher production costs. There are several potential business set ups, but all disruptive compared to traditional operation models. During pilot plant trials, all these open questions will be addressed and answered.

Acknowledgements

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1. Tony Covington, “Sustaining the global Leather Industry”, AICLST, 2014.
2. Buljan/Reich “Mass Balance in Leather Processing”, UNIDO, 2000.
3. r+impuls research program, Germany’s State Ministry of Science and Education (BMBF). 