Kior’s technology innovation process

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Introduction

Rising energy demand in US and across the universe accentuated by dwindling fossil fuel supplies meant non merely that the energy demand figures would shortly excel its natural stuff supply but would besides trip up the oil monetary values well. In response to this spurred urgency for development of alternate beginnings of energy, KiOR, founded by Paul O’Connor in November 2007 as a joint venture between Khosla Ventures, a venture capital house in Silicon Valley, and BIOeCON (another house by O’Connor in Netherlands) , aims at developing a proprietary engineering called Biomass Catalytic Cracking (BCC) with a possible to dramatically impact the emerging renewable energy landscape and works to be providers to biorefineries around the universe.

BCC is a procedure that converts cellulosic biomass into “ bio-crude ” , a hydrocarbon mixture with belongingss similar to crude oil. Bio-crude can be straight refined to do gasolene, jet fuel, and other distillations of crude oil. Most of other engineerings to change over biomass into bio-fuels are expensive, energy inefficient, or reliant on the usage of toxic chemicals, and bring forth ethanol instead than crude oil. The burning of ethanol generates less energy than gasolene, and does non seamlessly incorporate into the crude oil value concatenation. By March ‘ 2008, KiOR has successfully produced little sums of bio-crude in the lab, while the future action program for commercialisation of the engineering has been devised.

This study will closely analyse KiOR ‘ s Technology Innovation procedure to understand its strategic way from Commercialization position and eventually offer cardinal recommendations for successfully commercializing the engineering: Assessing Environmental Forecast, Conducting a thorough Market Analysis to understand client demands and Understanding the Fundss Involved.

KiOR ‘ s Technological Invention Analysis

Beginnings of Invention

There is adequate literature to back up the below Venn Diagram that in invention, such as BCC engineering by KiOR, there are tonss of interactions between engineering (BCC) , and concern (KiOR) , and Individual (Paul O’Connor) , and industry (strategic confederation between Khosla ventures and BIOeCON and KiOR) , and university (European universities) , and authorities and between engineering and merchandise, client (biorefineries) , and application (Betz, 2003, Schiling, 2008) .

As Schilling (2008) would depict that webs of pioneers that leverage cognition and other resources from multiple beginnings are one of the most powerful agents of technological progress. Furthermore, the person with merely a moderate grade of cognition of a field might be able to bring forth more originative solutions than an single with extended cognition of field that helped to depict why the engineering was successful from universities.

Type of Invention

Tidd et Al. (1997) would depict the alteration in invention in two ways: foremost, in footings of the type of invention (Product, Process or Service) and 2nd, in footings of the extent to which inventions (Transformational,

Radical or Incremental) alteration bing (market) state of affairss. Based on differentiations, between types of inventions, presented by Abernathy and Utterback (1978) and Damanpour and Gopalakrishnan (2001) in Damanpour et Al. (2009) based on external focal point, market driven, and the debut consequences in distinction of the organisation ‘ s end product for its clients, it would be just to sort the KiOR invention in signifier of Biomass Catalytic Cracking Technology to be a Product Innovation that has radically changed the “ procedure ” of deducing biofuels from feedstock. In this regard, Johannessen et Al. (2001) , on the footing of empirical research into different graduated tables of newness, concluded that the grade of radicalness is the most distinguishing factor in finding the newness of invention.

Additionally, while research workers like Rosenbloom and Cusumano (1987) and Bassalla (1988) would reason that technological alteration is gradual and incremental, in contrast, others like Tushman and Philip Anderson (1986) have offered the image of technological alteration as being rapid, even discontinuous, progressing through “ moving ridges of originative devastation ” (Schumpeter, 1934) . From the position of speciation (Day and Schoemaker, 2000) , the scientific development may be incremental but the displacement in application sphere is where the discontinuous “ originative devastation ” takes topographic point merely as in the instance of KiOR. Though the construct of Biofuels has been in the market over several coevalss, KiOR, by presenting its riotous BCC engineering has innovated the manner universe and more specifically US would near the lifting energy demand.

Cardinal factors for KiOR ‘ s design laterality (nit)

As Schilling (2008) would depict that many engineerings demonstrate increasing returns to acceptance, intending that the more they are adopted, the more valuable they become. One primary beginning of increasing returns is learning-curve effects. The more a engineering is produced and used, the better understood and developed it becomes, taking to improved public presentation and decreased costs. Another cardinal factor making increasing returns is web outwardness effects. Network outwardness effects arise when the value of a good to a user increases with the size of the installed base. This can be due to a figure of grounds ; this can be due to a figure of grounds, such as demand for compatibility or the handiness of complementary goods. Increasing returns can take to winner-take-all markets where one or a few companies capture about all the market portion.

The value of a engineering to purchasers is multidimensional. The stand-alone value of a engineering can include many factors (productiveness, simpleness, etc.) and the engineering ‘ s cost. In increasing returns industries, the value will besides be significantly affected by the engineering ‘ s installed base and handiness of complementary goods. Customers weigh a combination of nonsubjective and subjective information. Therefore, a client ‘ s perceptual experiences and outlooks of a engineering can be every bit of import as (or more of import than) the existent value offered by the engineering. Firms can seek to pull off clients ‘ perceptual experiences and outlooks through advertisement and public proclamations of preorders, distribution understandings, and so on. The combination of web outwardness returns to market portion and technological public-service corporation will

act upon at what degree of market portion one engineering will rule another. For some industries, the full web outwardness benefits are attained at a minority market portion degree ; in these industries, multiple designs are likely to coexist.

Key success Factors

1. Knowledge of intervention since it is a complex procedure. Need tonss of preparation for users.

2. Sourcing of biomass on the front end- demand ability to entree big measures of feedstock. Will take advantage of the slack in the mush and paper industry in the south-eastern United States. However, monetary value of feedstock will be lifting well.

*the longer term, acquiring equal biomass to make full the biorefinery was cardinal to the economic sciences of production. Necessitate some agents who can assist to cover with single landowners bring forthing biomass and acquire all the contracts in topographic point. Building relationship could take old ages.

3. Knowledge of the contact action and thermic snap on the production terminal.

BCC ‘ s Multiple Dimensions of Value

KiOR ‘ s Successful Timing of Market Entry (nit)

Scheme of first mover

First-moverFirst-

advantage mover

s disadvanta

	ges	
Brand Loyalty and Technological Leadership	Research and Development Expenses	
Preemption of Scarce Assetss	Undeveloped Supply and Distribution channels	
Exploiting Buyer Switching Costss	Immature Enabling Technologies and Complements	
Reaping Increasing Returns Advantages	Uncertainty of Customer Requirements	

As Schilling (2008) would reason that a first mover may be able to construct trade name trueness and repute for technological leading, preemptively gaining control scare resources, and work purchaser exchanging costs. First movers may besides profit from increasing returns to adoption due to larning curve effects and web outwardnesss. Some surveies, nevertheless, argue that first movers may hold higher failure rates. First movers have to bear the brunt of R & A ; D disbursals and may confront considerable consumer ambiguity. Second movers can capitalise on the R & A ; D and selling attempts of the first mover, bring forthing a engineering that costs less to develop and that corrects for any of the first mover ‘ s errors. First movers may besides confront ill developed provider markets, distribution channels, and handiness of complementary goods, all of which can increase the challenge of successfully establishing their new merchandise or service. Enabling engineerings may besides be immature, impeding the new engineering ‘ s public presentation. The biggest disadvantage many first movers face is uncertainness over client demands. Customers themselves may be unsure about what features or signifier they desire in a new invention. A house may hold to defy important losingss before client penchants become more certain.

Factors act uponing optimum timing of entry

As Schilling (2008) would explicate that the optimum timing of entry is therefore a map of several factors, including the border of advantage offered by the new invention, the province of enabling engineerings and complements, the province of client outlooks, the menace of competitory

entry, whether the industry faces increasing returns, and a house ‘ s resources.

1. how certain are client penchant?

End-users

Want to hold low monetary value and clean energy.

Refinery

Can sell to end-users

Costss of installing and compatible to the exist systems.

Costss of care

KiOR ‘ s strategic Location

Rater: green= 100 % , Yellow = 50 % and Red = 0 %

Depending upon the assorted standards in the above tabular arraies, it is rather apparent that factors like biofuels research Centre, close contacts with DOE ‘ s NREL and attractive grants make Denver (Colorado) suited to puting up the KiOR central offices while other factors like near propinquity to feedstock and place of major human endowment makes Houston (Texas) the preferable location for the fabrication works.

Perceived Risks for KiOR and BCC Technology

Different types of hazard must be considered in the rating of the engineering. Harmonizing to Day and Schoemaker (2000, 90) “ A procedure of hazard profiling offers directors a model for sing three specific types of hazards associated with the engineering ” as shown in the figure.

As Day and Schoemaker (2000, 91) would reason, in add-on to measuring hazards, direction at KiOR must besides analyse the fiscal, competitory and organisational impact of puting in the new BCC engineering and commercializing it. While the fiscal analysis at the early phase includes estimations of development costs, market size, merchandise pricing and gross revenues, and market incursion, Competitor ‘ s actions may include concern actions such as a hostile or friendly coup d’etat, cross-licensing of the engineering, legal challenge to IP places, and monetary value competition. The organisational impacts of the new engineering would besides include the organisations required for production and market channel entree.

Furthermore KiOR ‘ s BCC engineering being a extremist invention still in the Concept Development stage of the New Product Development Process, McDermott and O’Connor (2002) would reason that this engineering comes with high market and technological uncertainness and that KiOR must dig to understand the market needs of the clients (biorefineries) in order to minimise the hazards associated with this open uping engineering.

Issues and Recommendations

From overall analysis above, the cardinal issue is how to commercialize engineering.

Recommendations:

Organization pentacle (Beginning: new wave Kerkvoort, 1986, p. 138)

*** Assessing Environmental Forecast**

Twiss (1986, 47) discusses the importance of environmental prediction to set up what might be done to work the chances or run into the menaces originating from possible hereafter alterations in the concern environment. Additionally, cognition of how rivals will react to environmental alteration would be highly valuable for KiOR more specifically since it is the market innovator in this engineering and shortly should anticipate rivals to come in the market. Under the environmental prediction, KiOR must

u Identify hereafter menaces and chances by analysing the Porter ‘ s 5 forces model and the SWOT analysis.

u Avoid Technological surprises

u Identify new competitory engineerings and concerns.

*** Conducting a thorough Market Analysis to understand client demands**

u As much of the literature (Day et al. , 2000, Twiss, 1986) would reason that though the “ supply side ” considerations (KiOR ‘ s position) are of import, it is besides critical to see restraints and thresholds on the “ demand side ” every bit good (biorefineries and market restraints) since the spring to new application sphere affects the properties of the engineering that are developed every bit good as the resources that are available for its development. Undoubtedly, the biggest market for KiOR ‘ BCC engineering would be the biorefineries. Hence it is in the involvement of KiOR to understand whether BCC would be a profitable proposition to them or non and besides whether the terminal merchandise from BCC would be safe and at par with the industry criterions for their application.

u The other inquiry that KiOR should concentrate is: Where could KiOR topographic point its newcomer BCC engineering where it will boom? Should they rule in the intermediate market of should they vie in the chief market? Day and Schoemaker (2000, 70) argue to concentrate on choosing market contexts for a merchandise, instead than choosing merchandises for a fixed market context.

u Furthermore, after researching different markets for its engineering, as Day et Al. (2000, 70) would reason that because different consumers have different demands for buying merchandises and utilize different standards when measuring their options, therefore KiOR must analyse market heterogeneousness and should hold well-organized selling programs to react to each mark group

u Market diverseness may restrict the acquisitions of KiOR to where they look. Morone (1993) discusses that as companies “ investigation and learn ” about markets, what they learn may be straight related to where they probe. Since acquisition and version are feedback-driven procedure (Nelson et al. , 1982, March et al. , 1958) , determinations sing the beginnings of feedback have important deductions for larning and way alteration.

*** Understanding the Fundss involved**

Evaluation of undertaking profitableness should be one of the most critical facets non merely from the KiOR ‘ s direction position but in the benefit of its investors like Khosla ventures and later its share-holders. This procedure can be broken down into:

u Estimating outgos: The chief outgo incurred before BCC engineering eventually rolls-out and begins to gain a return on its investing consists of the Research & A ; Development costs including paradigm and pilot works building. Capital investing in fabrication works and initial selling costs.

u Estimating Gross saless Volume: Volume of gross revenues likely to be generated by BCC is one of the most hard factors to gauge, nevertheless, estimations do hold to be made since gross revenues volume is the concluding determiner of success. Twiss (1986) discusses a theoretical account to deduce expected gross revenues volume as a factor of Entire market size, Market portion, merchandise life and chance of commercial success.

u Pricing: Gross saless volume stand foring client credence is, nevertheless, a map of the monetary value charged, which in itself depends upon the sensed value of the merchandise to the possible market every bit good as the pricing of competitory merchandises. The net income which is sought from a new merchandise is a residuary, extremely sensitive to alterations in both monetary value and cost, hard to measure at a clip when the concluding signifier of the merchandise has non been established.

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