

OPPORTUNITY RECOGNITION FOR HIGHLY PROFITABLE PROJECTS IN LARGE CORPORATIONS

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ABSTRACT

Opportunity Recognition (OR) was studied in highly profitable platform and radical or discontinuous products developed in large billion dollar companies. Platform projects, which provides a whole new offering to the company and did not require high risk technologies, required a trigger event to get started, had a long gestation period and required senior management sponsorship. In contrast OR in discontinuous or radical highly profitable projects required superb highly inventive scientists who served as product champions and involved an element of fortuitous discovery. These results provide an initial glimpse into OR in large corporations, which has not been studied to the same depth as has occurred in OR in small businesses.

INTRODUCTION

Opportunity recognition (OR) - the process of finding a match between an unfulfilled market need and a solution that satisfies that need (Bhave, 1994) - has been perceived as a core attribute of entrepreneurship (Kirzner, 1979; Timmons, Muzyka, Stevenson & Bygrave, 1987). This area has received considerable scholarly attention in numerous studies (Christensen & Peterson, 1990; Kaish & Galid, 1991; Busenitz, 1996; Gaglio, 1997, Hills and Shrader, 1998; Zietsma, 1999) which have explored the process of OR that occurs during venture initiation in small business (i.e. less than \$100 million in yearly revenue). However, only one article in the small business nascent literature makes distinctions between OR between radical or breakthrough products and incremental ideas. Hills, Schrader & Lumpkin (1999) studying small businesses makes a distinction between OR associated with radical and incremental products. This study suggests that the dimensions of OR are different for radical and incremental ideas. Similarly absent from the nascent literature are articles which evaluate OR in large (i.e. greater than \$1 billion in yearly revenue) corporations. I would expect OR to be different since organizational structure and access to finances is fundamentally different. A recent study by Mathews, Ford and Human (2000) indicated that entrepreneurs in small businesses and large corporations perceive uncertainty, risk taking, business plan development and perceive growth expectations differently. Thus one would expect OR to be different at large corporations.

A recent article by O'Connor and Rice have explored OR in radical projects in large corporations (O'Connor and Rice, 2001). They define a radical innovation as one that offers "...potential for a 5-10X (or greater) improvement in performance, or a 30-50% (or greater) reduction in cost." Their study focused on true breakthrough or discontinuous innovations. For example, the first PC to them would be considered a radical innovation, while subsequent improvements would not. They studied 12 discontinuous projects on an ongoing basis. All of the projects had in common unproven and high risk technologies. In addition, all of them had long gestational periods. Eleven of the 12 had been around for more than 10 years. To date 5 of the projects have been introduced and have had moderate success, 5 are still in development and 2 have been abandoned. Based on their study they concluded that OR is highly dependent on individual initiative and that the capacity for the opportunity to survive within the organization. The latter being dependent on senior manager champions who protect the project from being canceled during its long gestational period. (Senior manager champions were found to be critical in 7 of the 12 cases.)

In a similar fashion we have also explored radical projects *–but have only focused on those that have already produced large profits and revenue for their company*. We have also performed case studies on platform (Meyer & Lehnerd, 1997) projects, which offered whole new product offerings in the company, but which were not discontinuous (i.e. the first project of its type in the market) nor typically involved kind of high risk technologies which are common to radical projects (see figure 1). The platform product was also new to the company, but not necessarily new to the world. These platforms also created large revenue and profits and spawned many incremental or line extensions. The platform projects provide a perspective against which the more radical or discontinuous projects may be compared.

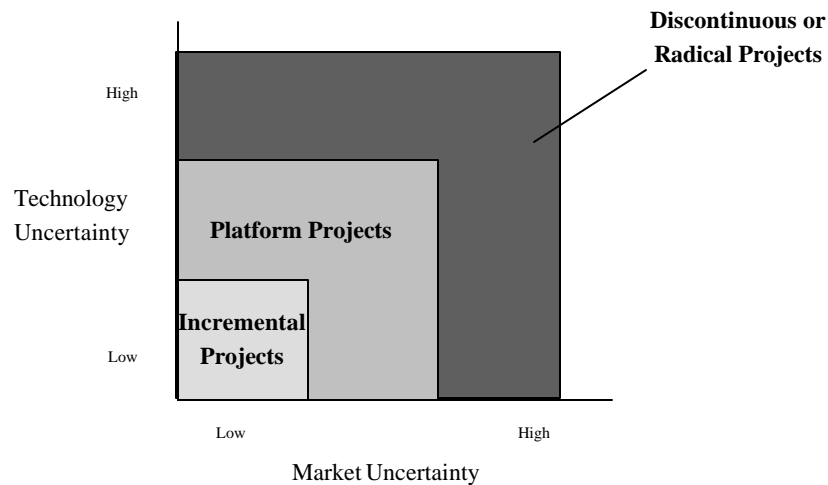


Figure 1. Schematic depicting the differences between radical, platform and incremental projects.

CASE STUDY METHODOLOGY

Case study research involves the investigation of projects in their natural setting. For each project I met with each of the team members involved in the discovery part of product development. My interest was in all aspects of OR and discovery – but concluded when actual product development efforts were begun. In depth interviews and re-interviews were done with all the team members. All interviews were taped and transcribed. As much as possible I gathered information from a variety of company representatives associated with each project to avoid post hoc rationalization. When there were conflicting stories I attempted to resolve them by re-interviewing team members and reviewing the documentation associated with the project. The case study results were then reviewed with the company. A total of 9 case studies have been completed however only 5 of the studies have been completely analyzed and are summarized below:

Platform Projects

Hellman's Low Fat Salad Dressing. The gestation period for this product was over 26 years. Initially started by individual initiatives before the market for low fat or dietary products was identified. The idea again surfaced many years later as a result of senior management looking for innovative products to offset a reduced revenue stream. However, it was killed because it would have involved a large

capital investment and the financials remained unattractive. It again surfaced after an acquisition which enabled the product to be manufactured without a large capital investment. The product was finally introduced to the market late with large revenues and modest profits.

Skippy Low Fat Peanut Butter. The gestation period for this product was over 23 years. Once again the product started with individual initiatives before the market for low fat or dietary products was identified. The idea resurfaced as a result of market trend analysis and the identification of a competitor who was already developing such a product. Senior management feared that such a competitive product would rapidly gain market share on their flagship high fat peanut butter product and immediately put together a high performance multi-functional team to introduce the product as quickly as possible. It took the team approximately 2 years to introduce the product after senior management initiated the effort. The major constraint that prevented earlier introduction was the identification of critical mixing technology that allowed the low fat peanut butter to have taste and texture characteristics which scored high enough in consumer testing. This product helped pioneer the market for low fat peanut butter and continues to earn a very healthy profit.

Reduced Cost Chemical for use in DuPont's Cyrel Flexographic Printing Plates. The gestation period for this chemical was approximately 4 months. The need for this product was to reduce the cost of a chemical which is used to make flexographic printing plates. A 10-15% reduction in cost would allow the company to penetrate new markets. However, the company's scientists over many years repeatedly indicated that it was impossible to achieve this goal. Unfortunately a fire in one of the vendor's plants made an important and expensive precursor to the solvent unavailable. The loss of this solvent jeopardized revenue in excess of \$50 million with a substantial profit margin. Nearly one-quarter of the sales of this division. With only 6 months supply left the CEO of the division directed that the *entire* 20 person R&D division to be directed at finding a suitable replacement. Within 4 weeks the team identified a different molecular configuration at a vendor which could be used with slight modification. These new precursors allowed over a 30% cost reduction! As a result the new solvent has allowed this division to enter whole new markets. Sales and profits have nearly doubled over what existed before the fire.

Discontinuous or Radical Projects

ExxonMobil Process Analytics and Software. The gestation period for this project was 4 years. This project identified a whole new methodology for running and

controlling a petroleum refinery. Prior to this invention gasoline octane level was evaluated in custom built engines which would produce “knock” if the octane level was too low. The gasoline was analyzed on a discontinuous basis (i.e. every few hours). In the event of a low octane level a large amount of gasoline would have to be discarded. Other drawbacks were the cost of the engine (in excess of \$100,000 each) and the frequent calibration that was required. This project was initiated based on a technology trend analysis showing the confluence of chemical analysis techniques being combined with the computational capabilities of the computer. This project received early and enthusiastic support from senior management as a result of the expected significant value. Unfortunately the initial technology chosen was found to be too sensitive to humidity conditions in the refinery. The technology team continued to advocate this initial technology and never could get it to work – which proved frustrating to the scientists for over two years and exasperating to senior management. This team refused to evaluate alternate technologies, which later worked, despite suggestions from their colleagues. These initial scientists “retired” from the company and R&D was perceived as not being able to deliver on a major project. The project assignment was then given to a 2nd group of scientists who were fortuitously skilled in a different analytical methodology which was not affected by the environmental conditions. The end result was new methodology for measuring octane of the gasoline at the refinery which resulted in huge cost savings and operational efficiency.

ExxonMobil Flexsorb. This is a unique chemical solvent that can remove containments (i.e. hydrogen sulfide) from refinery stake gases. As a result huge cost savings have been realized since high cost methodologies for cleaning the stake gases would not have to be implemented. This invention has been identified by a R&D publication was one of the 100 most significant inventions. The gestation period for this product was 9 years. The initial concept started as a need for a solvent to remove carbon dioxide. A unique molecular structure was developed by a highly inventive scientist with a long track record of inventions. It was developed at the direction of his R&D manager based on a perceived need expressed by the division. When the development was complete a new and immediate application was identified to remove containments from a new source of petroleum. The scientist was able to change the structure of the solvent to enable it to be used in this new environment. This success was the result of 2 factors: - Mother Nature (i.e. the structure could be modified) and the inventiveness of the scientist. The solvent saved many millions of dollars. However, a new application emerged which would save the company huge amounts of money. Stake gases had now become a problem as new environmental conditions were imposed on refineries. Once again the molecule was modified

successfully to remove these environmentally dangerous stake gases. This success was also the result of the same 2 factors.

OBSERVATIONS

Opportunity recognition has been receiving considerable more attention in the scholarly literature in small businesses. Though very little effort has been directed at segmenting opportunity recognition into low and high profit opportunities. Opportunity recognition in large companies has received even less attention. Though one ground breaking prospective study (O’Conner & Rice; 2001) has focused exclusively on radical projects. However, as a result of the retrospective research design the findings and their relation to ultimately profitability cannot be predetermined until the product has been launched – which has yet to occur in 5 of the projects. Further, the products which have been introduced have only achieved modest success.

I have taken a fundamentally different approach to our research. Our approach examines radical projects that have been already been successful. As a control I also evaluated OR in platform projects. This methodology is subject to flaws since post hoc rationalization could dominate the responses we get during the interviews. As much as possible I have tried to minimize this by interviewing as many people connected with the team and verifying the information I had obtained through memorandums and documentation concerning the project.

I found opportunity recognition to be significantly different when I compared highly profitable platform projects with similarly successful radical or discontinuous projects. I found four characteristics of OR to be common in platform projects and three characteristics common to discontinuous or radical projects.

Platform Projects

Trigger Event. In each case there was a “trigger” event (senior management opportunity recognition?) which enabled resources to be committed. In the case of Hellman’s low fat dressing there was a push to increase revenues as a result of the decreased market size in one of the company’s flagship products. In the second case, Skippy low fat peanut butter, the realization that a competitor started working in this area triggered senior management to begin the effort. In the third case of DuPont’s Cyrel Flexographic Printing Plates a fire triggered the R&D department to look for new precursors for the unavailable solvent.

Long Gestation Period. All of the projects had a long gestation period. Hellman's low fat salad dressing and Skippy low fat peanut butter were suggested over 26 and 23 years respectively. Even in the 3rd case, the need for a low cost chemical for Flexographic Printing Plates was a frequent request of marketing. It took the "trigger" event of a fire to create it.

Senior Management Sponsorship. In all of these platform projects senior management played an active role. In fact the "trigger" event made them a champion for the project. In the Hellman's low fat salad dressing case senior management ended up doing an acquisition – whose principal purpose was to obtain manufacturing capacity to make the dressing. In the Skippy low fat peanut butter case senior management assigned a team and was actively involved in their activities. In the 3rd case of the reduced cost chemical senior management made it the ONLY activity of this R&D department at DuPont.

Absence of High Risk Technologies. In all of the platform projects there was an absence of high risk technologies or technologies yet to be invented. In the low fat salad dressing case no new technologies were needed. The key factor preventing launch was adequate manufacturing capacity – which was solved with an acquisition. In the second and third case technologies which were not available to the company were needed. In the low fat peanut butter case a mixing technology was needed to achieve the correct texture and taste. Removing fat from peanut butter changes the taste and increases the viscosity of the mixture. How the ingredients are mixed during manufacture strongly influences taste and texture. For 2 years the team tried many methods to achieve success and finally found one that was used in the food industry – but not in their segment. Perhaps this product would have either been launched late or not have been as successful if they had not found this new technology. The same pattern occurred in the 3rd case. DuPont did not have a replacement for precursor chemical – even at the same cost. Based upon the new initiative DuPont did an extensive world wide search of all possible precursors. They did not have adequate time to invent a new one or develop manufacturing facilities to make the old one. Fortunately they found one. The story no-doubt would have turned out differently if they hadn't.

Discontinuous of Radical Projects

Superb Highly Inventive Scientists. In both cases – breakthrough process analytics and Flexorb– *highly inventive scientists* were involved. I use the term *highly inventive scientists* to mean people with greater than 25 patents, who have a well known reputation throughout the company as being among their top inventors and have a "track" record of inventions. The first set of inventors, which were using

the wrong technology in the breakthrough process analytic case, did not meet this definition. The inventor who finally did solve the problem met the definition of being highly inventive. Flexsorb was developed by an individual who had over 90 patents and was always mentioned as one of the most prolific inventors at ExxonMobil.

Fortuitous Discovery. In both cases there was overwhelming evidence of fortuitous discovery. The inventor in the breakthrough process analytics was an expert in FTIR – which is the exact technology needed to solve both the measurement and environmental issues associated with on-line measurement. This was a new technology at the time and the inventor was an expert in it. In the second case the novel chemical reactive solvent, which the inventor was expert in, was able to be modified to be soluble to the hazardous environmental gases. Subsequent effort over the last decade has failed to identify any solvents which do a better job. It was indeed fortuitous that the inventor was working in this area.

Product Champions. In both cases the inventors served as their own product champions. They were expertise in a particular technology and they appear to have kept looking for areas that it could be successfully applied to.

COMPARISON OF THESE RESULTS WITH THE LITERATURE

The importance of the individual in radical innovation and the need for a product champion was also indicated in the study by O'Connor & Rice (2001). However they did not sight the need for having highly inventive scientists nor indicate if the invention was a fortuitous discovery. I suspect that many of the radical projects undertaken by the companies they studied as being either impossible or that the company lacked the unique talent needed for success.

Comparison of the results with the small business literature is more difficult since most studies do not segment the companies they studied based on there success. However, one study by Hill (1995) evaluated OR in 15 highly successful entrepreneurs who were soon to be inducted in the University of Illinois at Chicago Entrepreneurship Hall of Fame. The type of opportunities they seemed to have focused on were more in line with platform type projects. The entrepreneurs demonstrated two (trigger event and senior management sponsorship) of the four characteristics found in OR in platform type projects. Highly successful entrepreneurs indicated that they have a special alertness toward opportunities. This is similar to a trigger event which increased the visibility of the project and was the impetus for its initiation in large companies. Senior management sponsorship is axiomatic – since in 86% (Hill; 1995) of the

cases they are the co-founder. I suspect that these founders in the start-ups were also not using high-risk technologies – but could also not discern that from the study. I also could not discern how long the gestation period was for the starting the opportunity.

IMPROVING OPPORTUNITY RECOGNITION IN LARGE COMPANIES

The platform projects studied here all produced significant revenues for the companies – but all had long gestation periods. In other words the opportunity for the platform project was recognized in the company for a long period of time. But it took an external trigger to enable the project. It would seem that creating earlier triggers would help the companies significantly reduce the gestation time. Perhaps the best way to artificially cause more triggers to occur and create a sense of urgency is to begin to envision the future through scenario building (Schoemaker; 1995).

Opportunity Recognition for Breakthrough and or discontinuous projects has different characteristics. In the examples studied the superb inventor continued to search for solutions for applications which could best use their expertise. Opportunities were recognized by ExxonMobil as a need to better measure the octane in the gasoline in the refinery and in the second case as being able to extract toxic gases produced in the refinery. Fortunately ExxonMobil had the right scientists to solve these very tough problems. I suspect that other large opportunities were not as successful since they neither had the right technology nor people to solve them. It would seem that identification and sponsorship of alternate technologies would have helped minimize the risk in these types of projects.

LIMITATIONS

There are two main limitations to this study. First not enough cases have been studied. This should be considered a pilot study. Secondly post hoc rationalization always remains a problem with retrospective studies of this type.

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