acura
pharmaceuticals, inc.

2015 North American Opioid Oral Abuse Deterrence Technology Innovation Award

FROST & SULLIVAN

50 Years of Growth, Innovation & Leadership

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Opioids are commonly prescribed by physicians as analgesics to treat moderate to severe pain. Because of their pain-relieving properties, opioids are readily accepted by patients across the world. However, physicians are occasionally reluctant to prescribe such drugs to patients on a regular basis due to their addictive properties and ability to induce euphoria.

Opioids are available both in immediate-release and sustained-release formulations. Immediate-release opioids, in particular, are commonly administered to provide quick relief from pain. However, because the product peaks rapidly in the blood stream, there is significant risk of the patient developing a tolerance for the drug, and thereby requiring increasingly larger dosages. This can make the patient dependent on the opioid, which can subsequently lead to addiction. Immediate-release opioids start their action in the gastrointestinal tract instantly, increasing the risk of overdosing fatally when consumed in large quantities.

One of the greatest risks posed by prescription opioids is their abuse for recreational purposes. The ability of opioids to induce euphoria tends to attract a sizeable population, including young as well as older adults, who tend to abuse them by consuming them orally, snorting them in powdered form, or injecting them into their systems through syringes, thereby exposing themselves to the health and other hazards that are associated with drug addiction, including overdose and death.

Oral abuse remains one of the top forms of opioid abuse and a key industry challenge that is yet to be addressed by opioid producing firms. Various attempts have been made to include an opioid antagonist along with an active pharmaceutical ingredient (API) in orally administered opioids to block the analgesic effects of the opioid if it is snorted or injected. However, much of the problems persist since these measures do not prevent the oral abuse of opioid-based prescription drugs.

To address the key issues associated with the oral abuse of opioid-based medication, Acura Pharmaceuticals, Inc. (Acura) has developed a novel technology platform. The company has proprietary technologies that address key issues of abuse by snorting and injection and is developing a product line to prevent the oral abuse of opioids.

Technology Attributes and Future Business Value

Visionary Innovation

For over a decade, Acura has been working to develop and commercialize tamper-

resistant products to tackle the abuse and misuse of prescription drugs. The Centers for Disease Control and Prevention terms drug abuse an epidemic as it affects millions worldwide. To combat this nuisance, Acura has developed Limitx™, which is a novel formulation that addresses the problem of excess oral consumption of tablets for recreational purposes. Laboratory tests conducted by Acura have confirmed the ability of Limitx™ to restrict the immediate release of the API into the gastric fluid when multiple tablets are consumed at once. Limitx™ supersedes existing formulations that are incorporated in immediate-release opioid prescription pain killers. The need for abuse-deterrent formulations has been expressed by the Food and Drug Administration (FDA) and remains one of the top unmet needs of the market. The lack of other abuse-deterrent products in the market that focus on oral abuse makes the Limitx™ technology unique and visionary, giving Acura an edge over its competitors.

Industry Impact

A 2015 FDA guidance lays special emphasis on the menace of opioid-related drug abuse and singles out immediate-release combination opioids as being in the most danger of being orally abused. The Limitx™ formulation is being developed to bring a number of transformative changes to the industry. Essentially, Limitx™ is moving the industry towards the development of orally administered immediate-release abuse-deterrent medications, a necessity that is thus far unmet. The National Institute on Drug Abuse (NIDA) from the National Institutes of health (NIH) has awarded a $300,000 grant to Acura for the Phase I development of Limitx™ which is meant to optimize the formulation and make it ready for human testing. Subsequent phases of the clinical trials will focus on human testing to characterize the abuse-deterrent features of the formulation. The interest from the FDA and financial support from the NIH to formulate oral abuse-deterrent products is likely to push the development of similar technologies and formulations from other manufacturers too. The innovative Limitx™ technology has the potential to become an industry standard and create a benchmark for other manufacturers, pushing them to upgrade their existing abuse-deterrent technologies and match the one formulated by Acura.

Product Impact

Acura is developing the innovative Limitx™ formulation utilizing hydromorphone as its sole active ingredient. Hydromorphone is an opioid that is administered to patients to alleviate moderate to severe pain. The company is also testing immediate-release hydrocodone bitartrate with acetaminophen (hydrocodone/APAP) tablets on the Limitx™ platform. With over 135 million prescriptions dispensed in 2014 in the United States alone, hydrocodone/APAP is the most commonly prescribed opioid for pain management. However, it holds the dubious distinction of being the most commonly abused prescription opioid through excess oral consumption. Using the novel Limitx™ technology, Acura is expected to prevent the oral abuse of both these opioids and simultaneously enhance their functionality. The Limitx™ technology retards the release of the API when too many

tablets are swallowed, thus thwarting the adverse effects of a deliberate or accidental overdose. The company plans to employ the technology to incorporate other opioids in the future, thus increasing its product portfolio under the Limitx™ platform. Acura plans to begin work on the Limitx™ hydrocodone/APAP formulation upon conclusion of the work on the optimization of the Limitx™ hydromorphone product. The release of the two products will eventually give Acura a higher competitive advantage over competing products and is expected to help the company achieve major market share gains in the next 5 years.

Scalability

Technology scalability is important for Acura. Since the 1990s, when Acura started working on Aversion® Technology, the company has been engaged in developing products intended to address medication abuse and misuse. The company emphasized the safety and efficacy of the API directed to relieve pain. Through its proprietary Aversion® Technology and Impede® Technology platforms, the company has successfully developed multiple abuse-deterrent analgesic opioids that cannot not be easily crushed and snorted or injected into the body through a syringe. Using its advanced hydrogel and polymer matrix drug delivery mechanism in its range of products, the company has been able to limit drug abuse. The effective scalability of its technology has enabled the company to move on to its next-generation drug delivery technology platform, Limitx™. This novel technology has the potential to be used across a number of opioid-based drugs that are commonly orally abused. The ever expanding customer base of Acura includes an approximate 135 million prescriptions who were prescribed hydrocodone/APAP opioid in 2014 in the United States alone. Since opioid-based analgesics constitute a multi-billion dollar market, abuse deterrent products hold immense value, both for patients as well as for manufacturers.

Financial Performance

Acura has witnessed promising growth in the last year and the 1st quarter results of 2015 have been encouraging. The company saw incredible growth in 2015 with revenue of $5.4 million in the first quarter, compared to revenue of $42,000 for the 1st quarter of 2014, registering a net profit of $1.2 million. This tremendous growth was obtained due to the licensing of one of the company's key products, Oxaydo™, to Egalet Corporation. Acura spent over $1.4 million in the 1st quarter of 2014 towards research and development (R&D) for 3 of its proprietary technologies, Limitx™, Aversion®, and Impede®. However, in the 1st quarter of 2015, the company streamlined its focus on the innovative Limitx™ platform. It has allocated $1 million to the development of formulations based on this platform to test the feasibility of the technology on other APIs and to ascertain its safety and efficacy. The company is expected to leverage the Limitx™ technology to address the growing need of the multi-billion dollar market of orally-administered opioids for pain management. The complete development and commercialization of products based on the Limitx™ platform is still 3-5 years away. However, the company expects to double its revenue and operating margin once the new formulations become available. Acura spends

around $2.3 million every quarter towards marketing, sales, and administration which are extremely crucial for the expansion of an organization.

Brand Loyalty

The new technology platform has widened Acura's reach in the opioids for pain management industry. With the FDA guidance and the grant from the National Institutes of Health (NIH), Acura has generated a positive response within the industry as well as amongst its customer base that comprises doctors that prescribe opioids as analgesics to treat moderate to severe pain. The pain management industry is heavily reliant on the physician's confidence in a drug. As the opioid prescription rate increases, so does the cases of opioid-related deaths, addiction, and abuse. The Limitx™ technology restores faith in the opioid drug delivery system and allows doctors to prescribe it in a risk-free manner. The company has filed a number of patents with the United States Patent and Trademark Office covering its Limitx™ technology platform, of which the first one was issued in August 2015. However, Acura is committed to the development of Limitx™ technology, irrespective of the patent status.

Brand equity is crucial for Acura as a firm developing abuse-deterrent opioid products. It not only helps the company grow, but also helps it sustain that growth. To further enhance brand loyalty, Acura is expected to develop the Limitx™ technology so it can prevent the snorting of prescribed opioids, and thereby address another unmet need.

Conclusion

Acura has been proactively focusing on meeting customer needs. With the development of the Limitx™ technology, the company has gained a distinct competitive advantage in the global market. The novel technology platform prevents the abuse and misuse of opioid-based medication through oral administration. The products that will be based on the Limitx™ technology will help curb opioid abuse and prevent overdose and addiction. The future is bright for Acura since it has the backing of the NIH to develop this novel technology. Because of its strong overall performance, Acura Pharmaceuticals, Inc. is recognized with the 2015 Frost & Sullivan Technology Innovation Award.

Significance of Technology Innovation

Ultimately, growth in any organization depends upon finding new ways to excite the market, and upon maintaining a long-term commitment to innovation. At its core, technology innovation or any other type of innovation can only be sustained with leadership in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.

- Acquire competitors' customers
- Generate awareness and interest
- Increase market share
- Grow the overall size of the market
- Balance price with profitability

- Increase brand equity
- Establish a strong brand identity
- Inspire customers
- Build a reputation for innovation
- Push the envelope

DEMAND

BRAND

Technology Innovation Leadership

COMPETITIVE POSITIONING

- Deliver superior value to customers
- Be a leader in innovation
- Implement innovation strategy
- Carve out a unique market niche

Understanding Technology Innovation

Technology innovation begins with a spark of creativity that is systematically pursued, developed, and commercialized. That spark can result from a successful partnership, a productive in-house innovation group, or the mind of a singular individual. Regardless of the source, the success of any new technology is ultimately determined by its innovativeness and its impact on the business as a whole.

Key Benchmarking Criteria

For the Technology Innovation Award, Frost & Sullivan analysts independently evaluated two key factors—Technology Attributes and Future Business Value—according to the criteria identified below.

Technology Attributes

Criterion 1: Industry Impact
Criterion 2: Product Impact
Criterion 3: Scalability
Criterion 4: Visionary Innovation
Criterion 5: Application Diversity

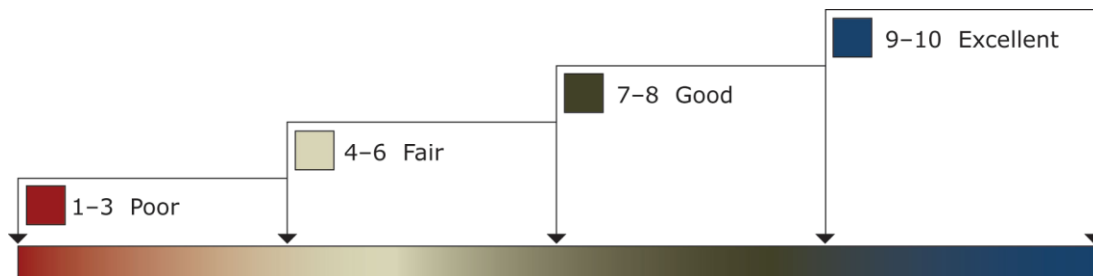### Future Business Value

Criterion 1: Financial Performance
Criterion 2: Customer Acquisition
Criterion 3: Technology Licensing
Criterion 4: Brand Loyalty
Criterion 5: Human Capital

Best Practice Award Analysis for Acura Pharmaceuticals, Inc.

Decision Support Scorecard

To support its evaluation of best practices across multiple business performance categories, Frost & Sullivan employs a customized Decision Support Scorecard. This tool allows our research and consulting teams to objectively analyze performance, according to the key benchmarking criteria listed in the previous section, and to assign ratings on that basis. The tool follows a 10-point scale that allows for nuances in performance evaluation; ratings guidelines are illustrated below.

RATINGS GUIDELINES

9–10 Excellent

7–8 Good

4–6 Fair

1–3 Poor

The Decision Support Scorecard is organized by Technology Attributes and Future Business Value (i.e., the overarching categories for all 10 benchmarking criteria; the definitions for each criteria are provided beneath the scorecard). The research team confirms the veracity of this weighted scorecard through sensitivity analysis, which confirms that small changes to the ratings for a specific criterion do not lead to a significant change in the overall relative rankings of the companies.

The results of this analysis are shown below. To remain unbiased and to protect the interests of all organizations reviewed, we have chosen to refer to the other key players as Competitor 2 and Competitor 3.

Measurement of 1–10 (1 = poor; 10 = excellent)			
Technology Innovation	Technology Attributes	Future Business Value	**Average Rating**
Acura Pharmaceuticals, Inc.	**9.5**	**9.2**	**9.3**
Competitor 2	8.5	8.5	8.5
Competitor 3	8.0	8.5	8.2

Technology Attributes

Criterion 1: Industry Impact
Requirement: Technology enables the pursuit of groundbreaking new ideas, contributing to the betterment of the entire industry

Criterion 2: Product Impact
Requirement: Specific technology helps enhance features and functionality of the entire product line for the company

Criterion 3: Scalability
Requirement: Technology is scalable, enabling new generations of products over time, with increasing levels of quality and functionality

Criterion 4: Visionary Innovation
Requirement: Specific new technology represents true innovation based on a deep understanding of future needs and applications

Criterion 5: Application Diversity
Requirement: New technology serves multiple products, multiple applications, and multiple user environments

Future Business Value

Criterion 1: Financial Performance
Requirement: High potential for strong financial performance in terms of revenues, operating margins and other relevant financial metrics

Criterion 2: Customer Acquisition
Requirement: Specific technology enables acquisition of new customers, even as it enhances value to current customers

Criterion 3: Technology Licensing
Requirement: New technology displays great potential to be licensed across many sectors and applications, thereby driving incremental revenue streams

Criterion 4: Brand Loyalty

Requirement: New technology enhances the company's brand, creating and/or nurturing brand loyalty

Criterion 5: Human Capital

Requirement: Customer impact is enhanced through the leverage of specific technology, translating into positive impact on employee morale and retention

Decision Support Matrix

Once all companies have been evaluated according to the Decision Support Scorecard, analysts can then position the candidates on the matrix shown below, enabling them to visualize which companies are truly breakthrough and which ones are not yet operating at best-in-class levels.
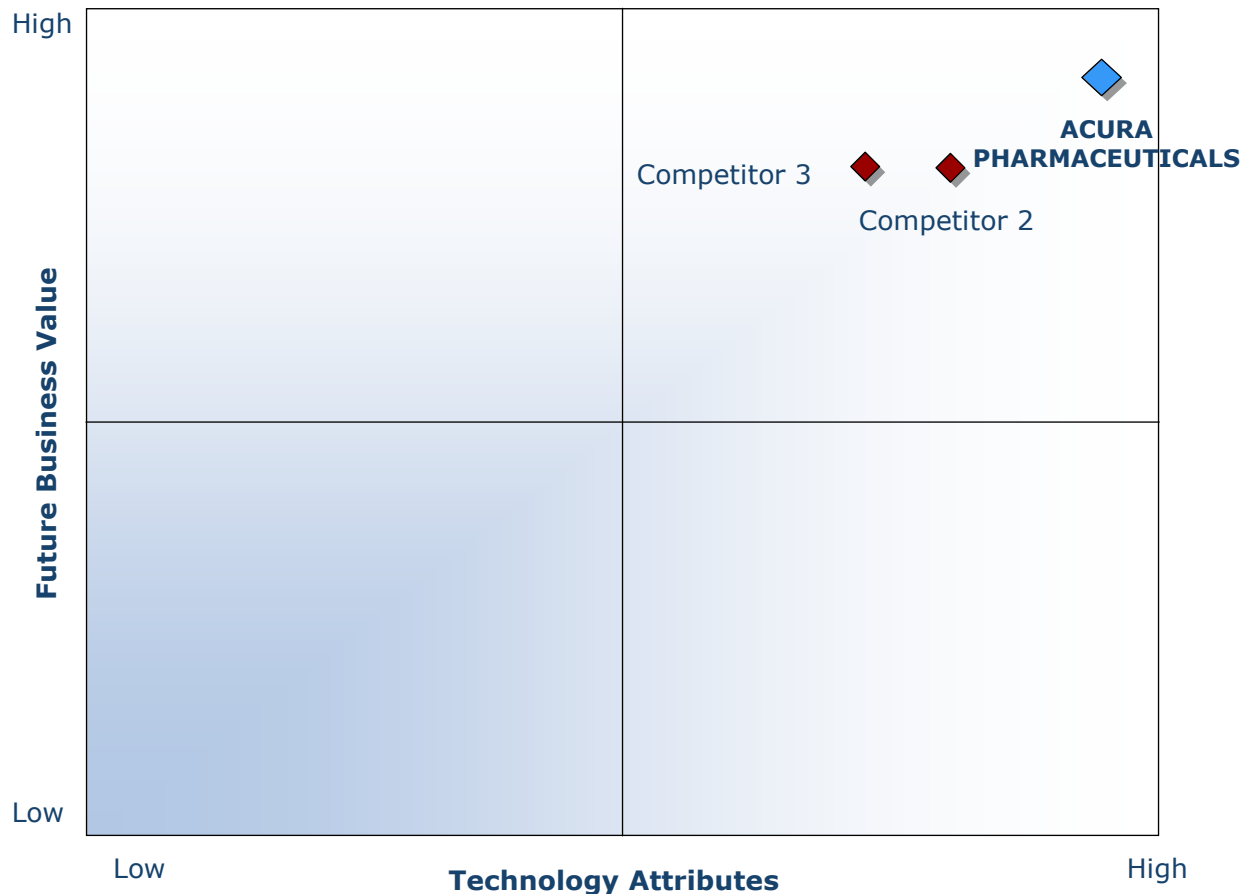
The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of our research process. It offers a 360-degree-view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often, companies make important growth decisions based on a narrow understanding of their environment, leading to errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry players and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS
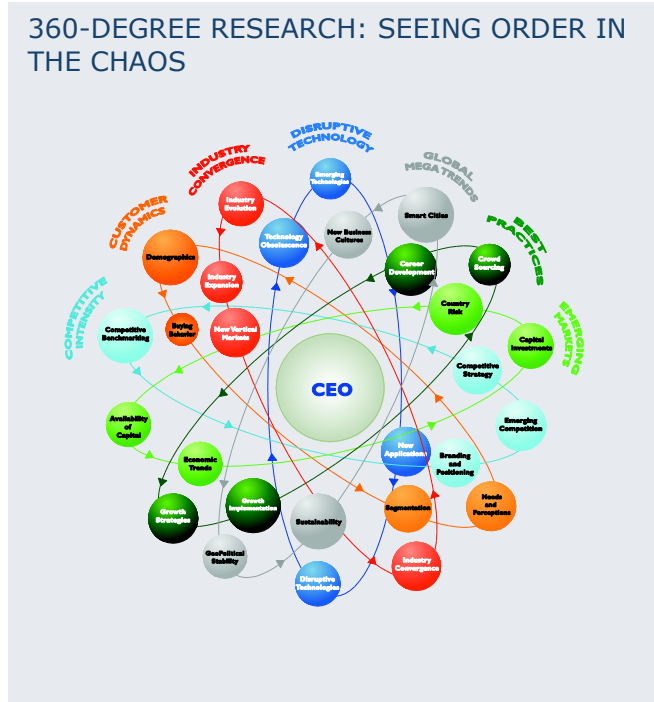
Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan Awards follow a 10-step process to evaluate award candidates and assess their fit with select best practice criteria. The reputation and integrity of the Awards are based on close adherence to this process.

STEP		OBJECTIVE	KEY ACTIVITIES	OUTPUT
1	**Monitor, target, and screen**	Identify award recipient candidates from around the globe	• Conduct in-depth industry research • Identify emerging sectors • Scan multiple geographies	Pipeline of candidates who potentially meet all best-practice criteria
2	**Perform 360-degree research**	Perform comprehensive, 360-degree research on all candidates in the pipeline	• Interview thought leaders and industry practitioners • Assess candidates' fit with best-practice criteria • Rank all candidates	Matrix positioning all candidates' performance relative to one another
3	**Invite thought leadership in best practices**	Perform in-depth examination of all candidates	• Confirm best-practice criteria • Examine eligibility of all candidates • Identify any information gaps	Detailed profiles of all ranked candidates
4	**Initiate research director review**	Conduct an unbiased evaluation of all candidate profiles	• Brainstorm ranking options • Invite multiple perspectives on candidates' performance • Update candidate profiles	Final prioritization of all eligible candidates and companion best-practice positioning paper
5	**Assemble panel of industry experts**	Present findings to an expert panel of industry thought leaders	• Share findings • Strengthen cases for candidate eligibility • Prioritize candidates	Refined list of prioritized award candidates
6	**Conduct global industry review**	Build consensus on award candidates' eligibility	• Hold global team meeting to review all candidates • Pressure-test fit with criteria • Confirm inclusion of all eligible candidates	Final list of eligible award candidates, representing success stories worldwide
7	**Perform quality check**	Develop official award consideration materials	• Perform final performance benchmarking activities • Write nominations • Perform quality review	High-quality, accurate, and creative presentation of nominees' successes
8	**Reconnect with panel of industry experts**	Finalize the selection of the best-practice award recipient	• Review analysis with panel • Build consensus • Select winner	Decision on which company performs best against all best-practice criteria
9	**Communicate recognition**	Inform award recipient of award recognition	• Present award to the CEO • Inspire the organization for continued success • Celebrate the recipient's performance	Announcement of award and plan for how recipient can use the award to enhance the brand
10	**Take strategic action**	Upon licensing, company may share award news with stakeholders and customers	• Coordinate media outreach • Design a marketing plan • Assess award's role in future strategic planning	Widespread awareness of recipient's award status among investors, media personnel, and employees

About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, enables clients to accelerate growth and achieve best in class positions in growth, innovation and leadership. The company's Growth Partnership Service provides the CEO and the CEO's Growth Team with disciplined research and best practice models to drive the generation, evaluation and implementation of powerful growth strategies. Frost & Sullivan leverages almost 50 years of experience in partnering with Global 1000 companies, emerging businesses and the investment community from 31 offices on six continents. To join our Growth Partnership, please visit http://www.frost.com.