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Table of Contents

Introduction	1
1. Stockholm Gases Approach to Innovation	2
1.1 Innovation at an Individual Level.....	2
1.2 Innovation at a Group Level.....	3
1.3 Factors Driving Group Level Innovation	3
1.4 Models of Group/Team Innovation.....	4
1.5 Innovation at an Organisational Level.....	4
1.6 Innovation at Intra- & Inter-Organisational Levels	5
1.7 Innovation Management	5
1.8 Role of Creativity in Innovation	6
1.9 Emergent & Prospective Models of Innovation	6
1.10 The Seven-Step New Product Development Process.....	7
2. Role of the R&D Manager in the Teeth Whitening Project.....	9
2.1 Individual Knowledge & Experience.....	9
2.2 Organisational Knowledge & Experience	10
2.3 Personal Traits of the R&D Manager as an Individual & Group Innovator	10
2.4 Increasing Costs & Complexity in R&D.....	11
3. Application of the Open & Closed Innovation Models in the Teeth Whitening Project	12
3.1 Application of Open Innovation Model in the Teeth Whitening Project	12
3.2 Globally Distributed Innovation	13
3.3 Useful Vs Best Practices in Organisational Knowing	13
3.4 Boundary-less Organisation s.....	13
3.5 Application of Closed Innovation Model in the Teeth Whitening Project.....	14
3.6 Determinants of Organisational Innovation & Design in the Teeth Whitening Project.....	15

3.7 Suggested Model of Innovation	16
4. Recommendations to the Munich Gases Board	16
Conclusion	18
References	19

Table of Figures

Figure 1 Group Innovation Growth Factors, Source: (Behfar, Turkina & Burger-Helmchen, 2017).	3
Figure 2 Innovation Management Components, Source: (Nambisan, et al., 2017)	6
Figure 3 New Product Development NPD, Source: (Hakansson, 2015)	8
Figure 4 Personal Traits of Marcus Leitz, R&D Manager, Source: (Ram & Ronggui, 2018)	11
Figure 5 Determinants of Organisational Innovation, Source: (Ganter & Hecker, 2013).	15
Figure 6 Situation Analysis of the Investment Decision, Source: (Lai, Lin & Lin, 2015).	17

Introduction

Munich Gases is the company discussed in the given case study. The Germany-based company operates from the city of Munich and is a key manufacturer of gases and liquids in Europe. Their primary products are liquid oxygen, carbon dioxide, and hydrogen gases, and they have a market capitalization of nearly €10 billion. Munich Gases employ 48000 people and in the 2009-10 financial year the company had €11.211 billion in revenues. Munich Gases spends €100 million a year for R&D and its emphasis on continuous R&D has allowed them to develop products and technologies to be served at various different industries.

The report aims to analyse the innovative approaches of another similar company, Stockholm Gases, and answer a few key questions based on the case study. The questions being, the study of a member of the Munich Gases management and his/her role; the application and evaluation of both open and closed innovation models in Munich Gases' R&D project; the recommendation of a suitable innovation model and the investment of €10 million into the project.

1. Stockholm Gases Approach to Innovation

Stockholm Gas AB is a Swedish natural and biogas supplier. The company was founded in 2008, and now is one of the leading suppliers of gas in the country. The company supplies natural and biogas for normal households, restaurants or even large real estate projects (LinkedIn, 2016). Stockholm AB emphasizes highly on innovation to meet its environmental sustainability goals.

The concept of innovation refers to major or minor changes in existing business ideas, products or objects. It also involves the effective and efficient application of those changes in achieving economic benefits for both the seller and the buyer (Ngo & O'cass, 2013). Innovation is an indispensable element for sustainable business growth in this age of information. That's why comparatively newer companies like Stockholm Gas rely heavily on innovation to increase the profitability and productivity of their products, their market, and marketing channels. Innovation is the component that helps to differentiate Stockholm Gases from other gas suppliers.

1.1 Innovation at an Individual Level

Individual innovators or small groups of innovators can bring more disruptive innovation than larger groups or teams. Individual innovators might or might not have any specific goals to achieve through his/her creativity. This type of innovation is not driven by any objective or time restraints (Dahlander, O'Mahony & Gann, 2016) An individual might innovate a major technological change that might increase the efficiency or productivity of organisational or manufacturing processes. Such innovators might be given special responsibilities by upper management or act spontaneously out of own curiosity. Individual innovation is a common phenomenon in the software and IT industry. Much of the great innovations in online media, like- Facebook, YouTube, Microsoft, etc. have come from such innovators or small groups of innovators.

In the case of Stockholm Gas, they have multiple projects that have stemmed from individual innovators. One of the company's major marketing and CSR projects were their sustainable street kitchen with the association of Paul Svensson (Stockholm Gas, 2019). The street kitchen promoted the use of both Stockholm Gas' biogas and sustainable cooking practices. The project is a great example of innovation at individual level.

1.2 Innovation at a Group Level

Group innovation is associated with the development of new products or corporate practices at business functional levels. Top-level executives in marketing, R&D, operations, etc., might identify the need for innovation in their particular departments, and form special innovation groups (Hueske & Guenther, 2015). This kind of group is a very common phenomenon in large corporate organisations. In this new fourth industrial age, the business environment is very complex and dynamic, which causes frequent disruptions in both technology and strategy.

In the case of Stockholm Gas, they have different target groups for their products. There are separate innovation and management groups for households, restaurants and real estates. For example, in the household market, there might be a need for different monthly or yearly gas supply packages for different household sizes. A specialized innovation group can assess the needs and demands of different households and develop better packages and pricing models. The restaurant market might demand customized or more professional services that might need further innovative approaches.

1.3 Factors Driving Group Level Innovation

There are a number of factors driving the growth and effectivity of group innovation in the corporate world, like-

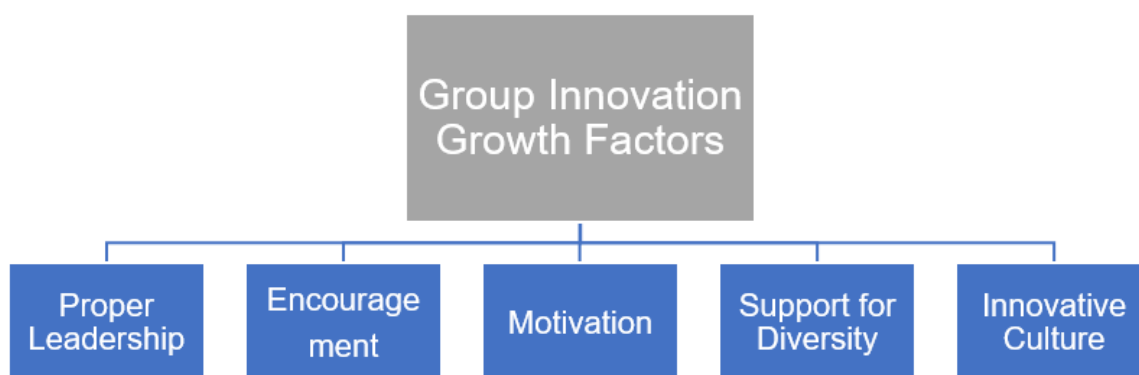


Figure 1 Group Innovation Growth Factors, Source: (Behfar, Turkina & Burger-Helmchen, 2017).

Proper leadership in the team/group which guides the team towards the final innovation objective. **Encouragement and motivation** from the top-level

management to be more productive in coming up with innovative ideas. **Supporting diversity**, in terms of ethnicity, gender, and specialization can supply the group with much-needed perspective changes leading to greater effectiveness (Di Medeiros, Ribeiro & Cortimiglia, 2014). **Development of an innovative culture**, which inspires the conception of not only a new product or idea but also a marketable experience.

1.4 Models of Group/Team Innovation

Radical Innovation & Incremental Innovation

Radical innovation refers to major or sudden changes in industries that can completely change existing business practices (Datta & Jessup, 2013). On another hand, incremental innovation develops business by adding small scale innovations in the business.z

Disruptive Innovation & Sustaining Innovation

Disruptive innovations, like the radical innovations, are random and sudden and can change the whole profile of an industry, whereas, sustaining innovation is practiced to sustain and develop the existing practices within the industry (Christensen, Raynor & McDonald, 2015).

1.5 Innovation at an Organisational Level

Organisational innovation is almost completely different from the previously mentioned two types. Such innovation refers to changes in the business model, organisational structure and business relationships, both external and internal (Camison & Villar-Lopez, 2014). Organisational innovation is pursued by companies when they intend to completely overhaul or change their product line, or the target market, or their entire supply chain. Strategical changes are also an example of organisational innovation.

In the case of Stockholm Gas, their shift from natural gas supply to biogas supply is a form of organisational innovation. One of the primary focuses of the company is environmental sustainability. Natural gases on their own emit 40% less CO₂ than carbon, and 25% less CO₂ than petroleum. But biogas' CO₂ emissions are 86% less than all other fossil fuels, which makes them the most sustainable option in this case. That's why Stockholm Gas has been gradually converting their gas supply from natural gas to biogas. From just 4% of its supply in 2015, biogas represents 44% of

the company's supply in 2019 (Stockholm Gas, 2019). This is a major organisational innovation in the context of Stockholm Gas.

1.6 Innovation at Intra- & Inter-Organisational Levels

Intra-organisational innovation denotes the collaborative innovative approaches between different functional groups within an organisation . Most vital innovation projects usually require the cooperative efforts of different departments (Scuotto, et al., 2017). For the launch of a new product or service, there needs to be intra-organisational innovation between the sales and marketing department, the operations and manufacturing department and the supply chain managing department. In the case of Stockholm Gas, the development of better technology to efficiently supply and control their biogas supply will need the involvement of their engineering, supply chain, and sales department.

Inter-organisational innovation refers to the collaboration between different organisations in the same or different industries in a vertical or horizontal approach. In the case of Stockholm Gas, their collaboration with the producers of natural and biogases for innovating more environment-friendly techniques for manufacturing is an inter-organisation innovative approach (Hollen, Van Den Bosch & Volberda, 2013). The company can also cooperate with other companies in the same industry to innovate better business practices.

1.7 Innovation Management

Innovation management is the management of all the processes required to effectively utilize innovation. It aligns the individual or group innovative approaches to the organisational strategy. Innovation management includes processes like, brainstorming new ideas, prioritizing those ideas based on usefulness, developing product or service prototypes based on those ideas, and creating economically profitable and marketable final products/services (Tidd & Bessant, 2014). Proper innovation management helps innovation efforts to effectively meet market opportunities. Innovation management is based on four fundamental elements, which are- the competencies of group members, the supporting organisational structure, the innovation philosophy and vision, and the organisational innovative tactics.



Figure 2 Innovation Management Components, Source: (Nambisan, et al., 2017)

1.8 Role of Creativity in Innovation

Creativity is the process of coming up with new and unique, ideas and thoughts. It leads to different perspectives in the business innovation process. The role of creativity in corporate innovation processes is crucial and undeniable. There cannot be any innovation without creativity (Bateson, Bateson & Martin, 2013). Creativity comes up with new ideas in which innovation practices develop into marketable and profitable products and services. Creativity is a highly demanded skill in the modern recruitment process. Creativity and innovation together ensure the sustainable operation of businesses in this age of information. This confirms increased productivity, and better decision making and problem-solving skills among employees and executives.

1.9 Emergent & Prospective Models of Innovation

Prospective innovation depends on forecasting the impacts of innovation before entirely implementing it in the market. The forecasts are based on the former innovations and implications of the company in discussion. Prospective innovation helps to calculate the probable returns of the innovation and its implementation process (Nelson, Buisine & Aoussat, 2013). In the case of Stockholm Gas, a prospective innovation would be, the development of less-CO₂-emitting biogas

technology. In a country like Sweden, the implications of this innovation would be, substantial market penetration, and up-gradation of the gas distribution network. The company could also patent the technology and license it to other companies outside of Sweden.

Now emergent innovation is the response of innovation strategies to reality. Forecasted perspective innovation isn't guaranteed to be correct, and many changes occur in the factors affecting industry innovation. This leads to some major and minor changes in the innovation process (Peschl & Fundneider, 2014). For example, in Stockholm Gas, the above mentioned prospective innovation might need changes if there are important amendments to government policies, or the research doesn't yield any results or the research costs much higher time and money than forecasted. Unless the company responds to those changes properly, all innovation efforts will be worthless.

1.10 The Seven-Step New Product Development Process

The new product development process or NPD is a seven-step approach to the designing and development of new products, covering everything from the inception of the product idea to the production of the marketable prototype (Baxter, 2018). The NPD model is applicable in the case of Stockholm Gas. The seven steps are-

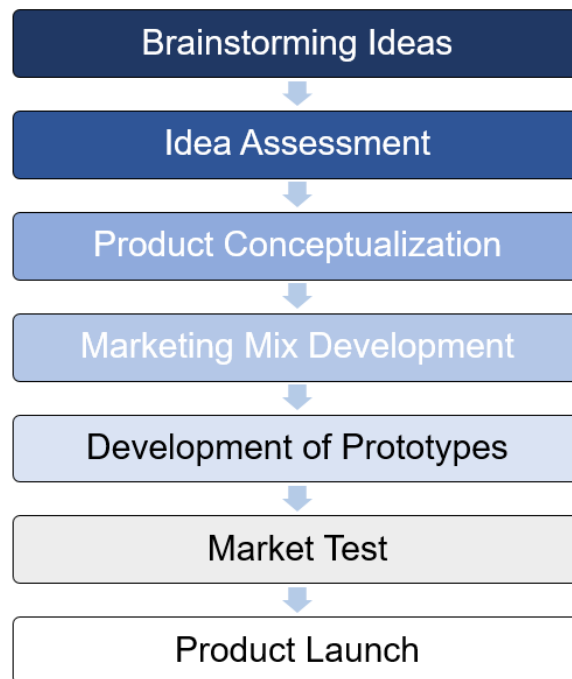


Figure 3 New Product Development NPD, Source: (Hakansson, 2015)

Brainstorming Ideas: Stockholm Gas can get the initial ideas from two different sources, which are- the internal sources (employees and managers) and the external sources (suppliers, customer feedback, industry partners, and government & non-government agencies). **Idea Assessment:** In this stage, Stockholm Gas screens all the ideas generated from the previous stage. The ideas are managed based on the usefulness of the idea and priorities of the company. **Product Conceptualization:** In the third step, Stockholm Gas develops the basic structure and features of the product and tests it based on customer expectations.

Marketing Mix Development: In this step, the company determines the marketing strategies and tactics, the target markets, the market segments, and the market positioning. **Development of Prototype:** In the 5th step, Stockholm Gas develops the product or service physically and gives the concept a tangible form. **Market Test:** In the test marketing phase, the company tries out their mix of marketing strategy and the product prototype to better prepare for their final launch. **Product Launch:** In the last step, Stockholm Gas, officially launches its product or service, by integrating all their sales, marketing, advertising, and manufacturing efforts.

2. Role of the R&D Manager in the Teeth Whitening Project

The head of R&D in Munich Gases, Marcus Leitz, leads and manages all the research and development in the company, including the teeth whitening project. Munich Gases have already spent €1 million researching the use of plasma technology in the whitening and cleaning of teeth. The research proved the technology to be totally safe and effective for human use, and now awaits the approval of the panel of senior management.

The R&D head, Mr. Leitz has played and will play some important roles in the R&D management process. First of all, he manages all the new innovation and product development ideas. He evaluates the ideas and assesses the viability of implementing them commercially. He also has to keep track of the new developments in the science and technology world and analyse if the company can successfully exploit them (Gupta & Singh, 2015). The R&D manager also has to assess the needs of his company and initiate R&D programs and projects that will create value for Munich Gases. The R&D Manager is responsible for integrating innovation & technology to ensure sustainable growth and competitiveness of Munich Gases.

In this Teeth Whitening Project, Marcus Leitz is responsible for coordinating all the technological research and business innovation. He has developed a number of commercially feasible options according to the company's needs, like the professional and consumer market options and the technology licensing options. He has also chaired the panel of senior management who are deciding on pursuing the teeth whitening project. Mr. Leitz is also responsible for keeping a check on the project costs and ensuring that the R&D project yields enough returns and profits for Munich Gases.

2.1 Individual Knowledge & Experience

Mr. Leitz as the R&D manager of Munich Gases has some specific and necessary personal skills, knowledge & experience. He has the required academic knowledge in the scientific and technological background which is necessary for running the technology and innovation-based R&D department. And as a manager he also the personal soft skills to effectively manage his employees. He has great communicative and speaking skills for conveying the corporate vision and values to

the R&D employees. He also has the necessary social skills to act as a liaison between the R&D department and the Munich Gases CEO and the Board. He also has an open and innovative mindset, so he is open to all the ideas and concepts that might be valuable for Munich Gases.

2.2 Organisational Knowledge & Experience

The R&D department of Munich Gases is an important functional unit of the company and requires specific organisational skills and competencies. As the R&D manager, Mr. Leitz has some particular functional skills, like the relevant technical and analytical skills (Spithoven, 2013). By applying these skills, he can properly coordinate the different innovation groups in his department and relate the value gained from those groups/projects to the corporate profitability of Munich Gases. Mr. Leitz also has necessary leadership and management skills, needed to efficiently and effectively manage the product development and design processes in the R&D department. He has been with Munich Gases for a substantial period of time and is completely aligned with the organisational culture and code of conduct of the company.

All the personal and organisational skills, knowledge and experience have a great impact on how productive and efficient the Teeth Whitening Project is within the Munich Gases R&D department.

2.3 Personal Traits of the R&D Manager as an Individual & Group Innovator

There are some specific personal traits accountable for the success of Marcus Leitz as the R&D manager, such as-

- ✓ Inquisitiveness, which leads the manager to be an initiator regarding new product and innovation projects.
- ✓ Risk-taking mentality, which makes him initiate projects that might have higher risks but also offer higher returns.
- ✓ Team-player mindset, making the manager compatible and adaptable to all kinds of innovation groups and also makes him a participative individual.

- ✓ The ethical personality of the manager and leader, which can spread into general employees and evolve into a sustainable ethical culture across the entire department and the company.

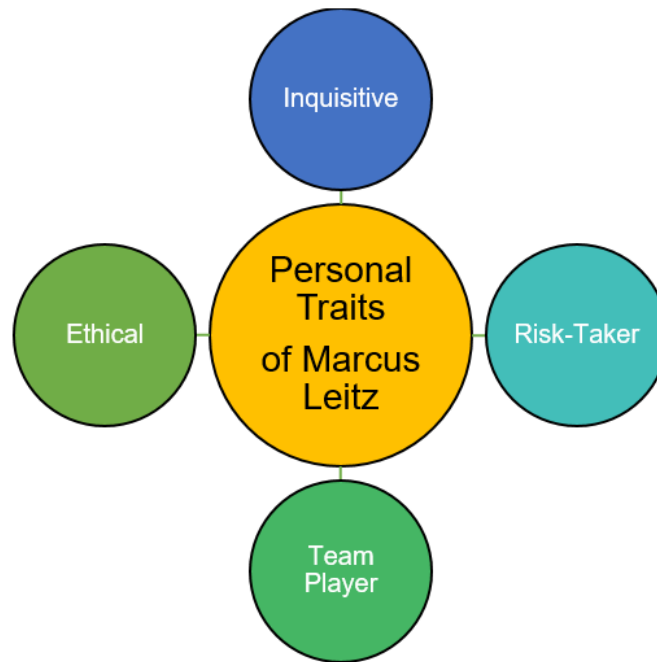


Figure 4 Personal Traits of Marcus Leitz, R&D Manager, Source: (Ram & Ronggui, 2018)

As the R&D manager, Mr. Leitz also has to be highly creative to identify market opportunities. He also has to be open to experimentation and risks to be successful in R&D. Finally, he also needs social interaction skills to properly socialize and communicate with his employees and top-level executives.

2.4 Increasing Costs & Complexity in R&D

Global R&D spending has risen substantially over the last few years. In 2018, global R&D expenses had risen to \$782 billion (Groupner, 2018). The main reason behind this increase is the demand for innovation. In the current global business environment, innovation is key to maintaining competitiveness. Munich Gases might spend only €100 million for R&D today, but without investing more behind this sector, the company won't be able to sustain its profitability. The truth is, companies today spend more on R&D than they do for advertising or marketing (Harvard Business Review, 2019). Another obstacle to innovation is the organisational and

management complexity of companies. Businesses can ensure efficient functioning of the R&D through simplifying and intensifying the innovation management structure and guaranteeing effective communication between different functional divisions.

3. Application of the Open & Closed Innovation Models in the Teeth Whitening Project

3.1 Application of Open Innovation Model in the Teeth Whitening Project

Open innovation refers to the free, unobstructed flow of information to and from the organisation with external components for better and collaborative development of information. In open innovation firms can not only source information and ideas from their own internal resources (R&D and general employees) but can also source them from all kinds of external sources (Academics, customers, suppliers, distributors, etc.), effectively multiplying the number of sources. Open innovation also helps to reduce costs in R&D (West, et al., 2014). Through this model firms can outsource ideas, which has led to demise of knowledge-based monopolies. But the flow of ideas is not only incoming, it can also be outgoing. The flow of ideas from large firms to society can be hugely beneficial. If open innovation is observed from the Schumpeterian view, where innovation is responsible for the investments and financial fluctuations in business, the open innovation model will be considered inefficient, as the firms don't have control or possession over unique and innovative ideas, and fail to secure continuous investments. And from the Post-Schumpeterian view, open innovation will be considered efficient and useful, as it supports the free flow of information and emphasizes communication.

In the case of Munich Gases, already €1 million has been spent on the research of the plasma gas technology, based on the open innovation concept. So, in this stage of research, the company can more widely implement the open innovation model and involve intellectual and academic people in the development process, as these are the people who actually innovated the technology. Munich Gases can also cooperate with its key suppliers and distributors, who can respectively help to reduce the production costs and develop a more convenient teeth whitening product for the customers. This way they can deliver a market-ready product in a very short period of time.

3.2 Globally Distributed Innovation

Globally distributed innovation or simply distributed innovation, is an open innovation concept, which discusses the cooperation between entities or people with commercially feasible ideas and the ones with the resources to exploit those ideas for financial gains (Chen, et al., 2017). This concept has given rise to venture capitalist who invests in ideas rather than organisations. With the higher mobility of knowledge and ideas, there are a lot of people with great ideas, who lack financial or organisational support. Venture capitalists invest in those ideas, and this way both the parties get returns. But this concept doesn't apply for Munich Gases, as they don't lack the idea nor the necessary resources.

3.3 Useful Vs Best Practices in Organisational Knowing

Organisational knowing in a company is related to the management and utilization of information for various reasons within the company. The information might be used to perceive and understand the changes in the business environment. The information might also be used for innovation and the generation of new ideas. Lastly, the management can also use the information to make important decisions. Now there are differences between useful and best organisational knowing practices (Nicolini, 2016). All practices can be useful but only can be the best. For example, in Munich Gases, the use of customer information to assess the demand for a specific product to use in the manufacturing process is a useful practice. But the use of that data to discover a market opportunity and innovate a new product is the best practice.

3.4 Boundary-less Organisations

Boundary-less organisations are driven by ideas and innovation and defy the hierarchical and structural boundaries put in place by the traditional business models. Boundary-less organisations are very adaptive to change in the industry and are somewhat perfect for this dynamic business age (Foster, 2015). Such organisations lack any kind of structure and promote the free flow of information and organisational flexibility. As real-time communication is a vital element of boundary-less organisations, they are usually heavily dependent on information technologies. In the case of Munich Gases, a traditional business, the implementation of the

boundary-less model could be beneficial but the whole process would be very difficult and time-consuming.

3.5 Application of Closed Innovation Model in the Teeth Whitening Project

Closed innovation is based on the concept of the value of information. In this age of information, ideas and thoughts can be transformed into lucrative profits. That's why large corporations invest heavily in closed innovation models. They use their financial leverage to hire the most intelligent and brightest people in the field and provide them with all kinds of facilities. In the closed innovation model, the internal researchers are free from the industry pressure and take their time to develop marketable and profitable ideas and concepts (Worsnop, Miraglia & Davies, 2016). In this model, the researchers work towards a common goal, which increases the efficiency and effectiveness of this model. As this kind of innovation is kept secret, there is minimal risk of competitors, and that's why companies can take their time, assess the market demand and then release the product. From the Schumpeterian view, the closed innovation model can be considered highly useful and effective, the reason being they provide large companies with unique and pure, ideas and innovations, which help those companies to secure constant investments and cash flow. But from the Post-Schumpeterian view, this model is deemed ineffective, as the model obstructs the free flow of information and blocks the communication with the external world.

In the case of Munich Gases' Teeth Whitening project, the open model of innovation had been followed, as the firm got the initial idea from a group of academics at USC. But in this stage of development, the closed model of innovation can still be successfully applied. Munich Gases can hire more people specialized in plasma technology and dentistry, and build state of the art research facilities for them, where they will develop a feasible teeth whitening product for the European market. With greater integration among the different functional units of the company and the research team, the development of a profitable plasma cleaning product will be much easier.

3.6 Determinants of Organisational Innovation & Design in the Teeth Whitening Project

A number of factors determine the organisational innovation and design in Munich Gases' Teeth Whitening project, which are-



Figure 5 Determinants of Organisational Innovation, Source: (Ganter & Hecker, 2013).

The Mission & Objectives of Management

This factor is crucial, as, without a proper mission and objective, the innovation management process cannot guide the employees or evaluate the progress of the innovation process.

The Strategic Alignment of Innovation Efforts

This factor is undoubtedly essential for the organisational innovation and R&D in the teeth whitening process, as it is the planning, execution and control element of the whole innovation process. (Jantz, 2015)

Brainstorming Initiation

The innovation process starts with brainstorming or the generation of ideas. This factor is so important because, without the proper and timely initiation of the brainstorming phase, other phases cannot be properly executed.

Outlining the Search Field

The search field refers to the target market or situation where the innovation will make its impact. Properly outlining the search field ensures that all the innovation efforts are being directed towards a single direction, which increases the efficiency and productivity of the entire process.

A Well-Designed Innovation Development Structure

Without such a structure or system, the innovation process can suffer from organisational complexity. Setting some criteria about the prioritization of ideas, and a common process for the execution of ideas can ease the innovation process a lot.

3.7 Suggested Model of Innovation

After analyzing all the pros and cons of the different models' innovation, it has been decided that the closed model of innovation would be best suitable for Munich Gases. The technology at hand is very sensitive and Munich Gases has already spent €1 million in the initial R&D process. By investing another €10 million into the project, the company can hope to achieve a commercially viable product. But they will also have to invest in the development of their distribution channel and customer feedback management.

4. Recommendations to the Munich Gases Board

The board of directors of Munich Gases requires a decision and a recommendation from the panel of senior management personnel overseeing the Teeth Whitening Project. Upon approval of the board, the project will be financed by €10 million to be further developed into a market-ready and profitable product.

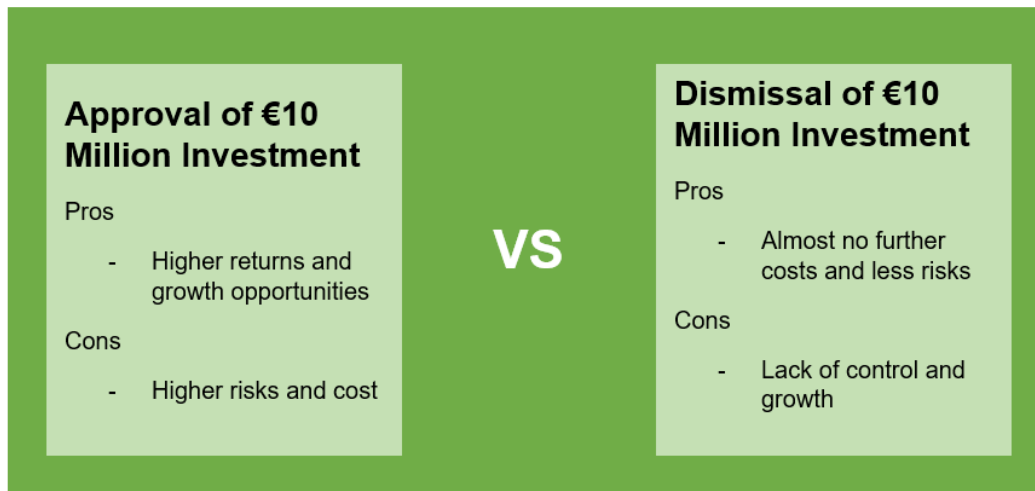


Figure 6 Situation Analysis of the Investment Decision, Source: (Lai, Lin & Lin, 2015).

Situation Analysis: €10 Million Investment Approved

If the project gets further €10 investment from Munich Gases, the R&D team can take many different approaches, all of which can be profitable for the company in the future. Firstly, the company can develop a convenient product for the consumer market, which has vast financial potentials, but also has high risk of competitors, like- Colgate-Palmolive, Unilever, Procter & Gamble, etc. To tackle the competitors Munich Gases could form partnerships with large retail giants in Europe, like- Aldi, Lidl, etc. In the consumer sector, the company can pursue the razor-cartridge pricing model, where the initial cleaning device would be sold at a very low margin, while the refills would be sold at a much higher margin. Munich Gases can also pursue the professional market with the dentists and other professionals. The company could charge less upfront and collect revenue through royalty, maintenance, and after-sales service later. This market has a lot less risky, but the returns are also low. It should be considered that, whichever market is chosen, the R&D costs will be the same, €10 million.

Situation Analysis: €10 Million Investment Rejected

If the project doesn't get any further investment from the company, the findings till now can still be exploited for financial gains. It should be noted that the company in no circumstances can abort the project, as the innovation is sensitive and valuable, and will have long term impacts on the oral care market. The option in case of no more investment would be licensing, which can be very profitable, as several other

franchises and licensing companies have shown. The plasma technology developed till now can be licensed to other companies who will conduct their own R&D on the technology and develop marketable products using their own resources. The companies that have licensed the technology will pay Munich Gases a fixed licensing fee and a fixed percentage of the sales as royalty fees. This way Munich Gases can earn substantial amounts of revenue without spending the additional €10 million on R&D. But this option might limit the growth and control of the company's cash flow and this way Munich Gases would have to depend on the R&D efforts of the licensee company, which is another risk on its own.

Final Recommendation

The final recommendation actually depends on the ROI of all the three options discussed before. But without considering the ROI, Munich Gases should definitely go for the 1st option. The reasons are- Munich Gases is a large and resourceful company, and they should take the risk of pursuing an opportunity like this. The innovation and technology at hand will greatly disrupt the dentistry industry, which is essential for the sustainable growth of a company like Munich Gases.

Conclusion

To conclude this report, the importance of innovation in modern business must be mentioned. Innovation means change and it is the driving force behind global progress. Currently, the world is experiencing the fourth industrial revolution. And in this age, a company that doesn't change or innovate doesn't survive. Innovation is the solution to a wide range of problems, from major economic problems to global environmental problems. Innovation is essential for growth and sustainability, the key elements of modern businesses. To properly manage and guide innovation, appropriate management is also required, along with the skills and capabilities of individuals. Businesses around the world are currently following a trend where they are having to increase their R&D spending every year to keep up with the changes in the market. And such costs might keep rising in the future, as the complexity in the R&D and innovation scenario keeps increasing.

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