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Aspects of an Ambidextrous Organization for Plant Engineering and Construction to Master Exploration and Exploitation

A Master's Thesis submitted for the degree of
"Master of Business Administration"

Supervised by
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Vienna, July 30th 2010

Affidavit

I, JOHANN BACHMAYER, hereby declare

1. that I am the sole author of the present Master`s Thesis “ASPECTS OF AN AMBIDEXTROUS ORGANIZATION FOR PLANT ENGINEERING AND CONSTRUCTION TO MASTER EXPLORATION AND EXPLOITATION”, 80 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool,

2. that I have not prior to this date submitted this Master’s Thesis as an examination paper in any form in Austria or abroad.

Vienna, July 30th 2010 _____

Signature

Preface

This Master Thesis reflects my work in development and engineering of economical cleaning systems for exhaust gases and flue gases throughout the past years. It is supported by Scheuch GmbH.

I would like to thank Andrea Freisler-Traub, who made it possible to join the Executive MBA Program, Herbert Kendler for supporting me, Martin, Stefan, Serban, and all other the colleagues for great teamwork, inspiring and motivating conversations, and my wife Veronika for her understanding and thoughtful behavior.

Abstract

In the past few years the international market of plant engineering and construction has changed dramatically from a buyer's market to a seller's and again to a buyer's market. Costs and prices have changed dramatically from extremely low to extremely high and again to devilishly low. Furthermore price pressure increases through globalization and vendors from low cost countries join the global market place. The financial crisis causes rapidly declining revenues and margins. The idea of offshoring activities puts a new emphasis on engineering-driven industries.

These dramatic developments in the markets require huge efforts to act quickly and to readjust structures and processes within a company. Cross-functional cooperation need to be adapted to optimize the value creation structure.

The adaption of the actual price situation, the requirement of new products and services, the internal shift of resources to where the firm actually, and very immediately needs it, new skills and behaviors are necessary, geographical shifts of main markets need to be mastered, and also stable and optimized processes for low cost – high quality manufacturing is desirable. Centralized or decentralized research activities and product developments are to be handled with care to foster competitiveness and future growth of a company.

Existing markets decline and new markets come up in very short time periods.

To bundle core competencies and leverage them to new markets and to new products, it is necessary to foster small units as start ups to get the organic structure to explore efficient new fields of research and development and to be able to bring disruptive innovations successfully into markets.

But there are also products with a much longer life cycle. For these products it is essential to foster incremental innovations to differentiate them and bring them to cost leadership. Therefore it is very important to implement effective methodologies for innovation management to meet customer needs but not to overfill them.

To handle all these requirements I have to think about the existing structure of a company with all its advantages and disadvantages and to bring in new ideas and to put into effect these ideas. Creating and hosting a culture and innovation network to foster open innovation is essential! Internal skills and competences in research and development of products and processes enhance long term success of a company. Innovator roles, team work, and project management are the basis for driving the innovation process. A plan for growth, a target innovation portfolio, and efficient innovation management ensure an environment for long term success. In the plant engineering and construction business, a lot of technology driven and market driven innovation is required. The challenge is to get the right balance between innovation and execution, between exploration and exploitation.

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1 Introduction

To get a better understanding how to drive a business and fostering innovation – exploration and exploitation – it is very important to have knowledge about basic theories lying behind all these activities.

1.1 Disruptive innovation theory

Existing companies have a high probability of beating entrant attackers when the contest is about sustaining innovations. But even well established companies may lose the competitive battle against new attackers who are armed with disruptive innovations (Christensen, 2003) that deliver a product or service at much lower cost, and are in addition able to deliver a new functionality and/or quantum leaps in performance.

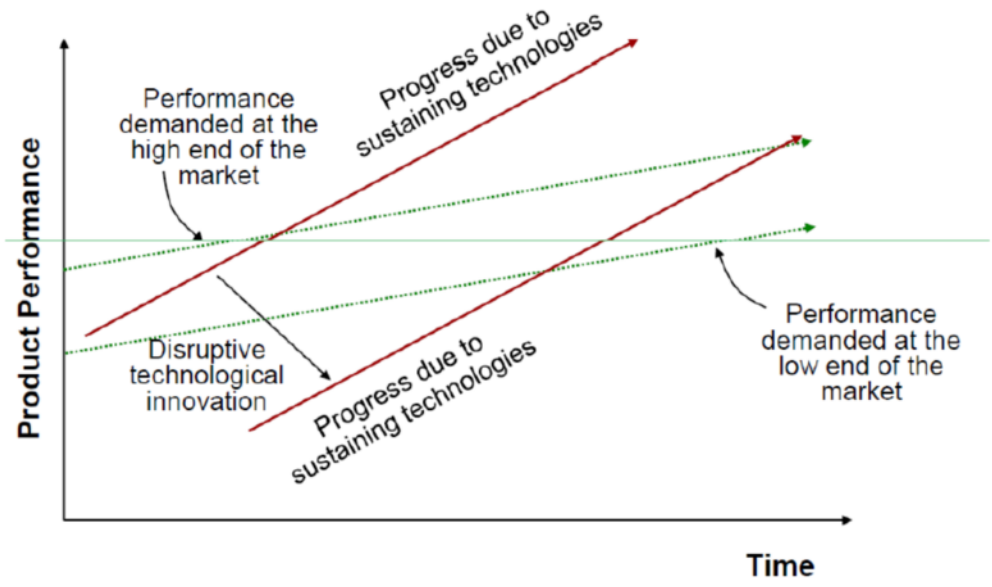


Figure 1: The impact of sustaining and disruptive technological chance (Christensen, 2003)

1.2 Resources, processes and values theory

This theory (Christensen, et al., 2004) explains why existing companies tend to have such difficulty grappling with disruptive innovations. Resources (Grant, 2008), what a firm has, processes, how a firm does its work, and values, what a firm wants to do, collectively define an organization's strengths as well its weaknesses and blind spots. Organizations successfully tackle opportunities when they have the resources to succeed, when their processes facilitate what needs to get done, and when their values allow them to give adequate priority to that particular opportunity in the face of all other demands that compete for the company's resources.

1.3 Value chain evolution theory

Producing a product or delivering a service requires completing a set of activities. Companies have the choice to integrate, executing most of the activities themselves, or they can choose to specialize and focus on a narrow range of activities, relying on suppliers and partners to provide other elements of value added. Organizations need to integrate across the interfaces in the value chain that drive the performance of what is not good enough. The primary interest lies in those capabilities that can provide a basis for competitive advantage, like a rule of thumb recommends: “Do what you can do best – and let the others do the rest”. Industries tend to evolve from states of interdependence where leading firms need to be vertically integrated, to modularity, in which specialist firms that are responsible for critical pieces of the value chain and produce key product components can earn a disproportionate share of value in an industry.

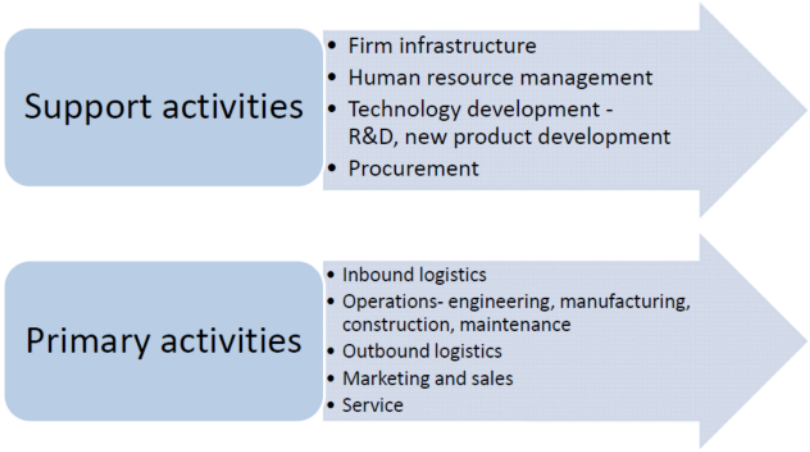


Figure 2: Porter's Value Chain

1.4 Corporate entrepreneurship

Corporate entrepreneurship (Hisrich, et al., 2008) can bridge the gap between science and the market place. Existing businesses have the financial resources, business skills, and frequently the marketing and distribution systems to commercialize innovation successfully. Yet, too often the bureaucratic structure, the emphasis on short-term profits, and a highly structured organization inhibit creativity and prevent new products and businesses from being developed. Corporations recognizing these inhibiting factors and the need for creativity and innovation have attempted to establish an entrepreneurial spirit in their organizations. In the present era of hyper competition, the need for new products and the entrepreneurial spirit have become so great that more and more companies are developing an entrepreneurial

corporate environment, often in the form of strategic business units.
Corporate entrepreneurship involves a bundle of measures which are all intended to foster the value creation of innovations with a higher degree of innovativeness.
The question is whether entrepreneurial values and management approaches should only apply to highly innovative, disruptive activities, or also to some extent to normally innovative projects.
E.g. The role of the project leader would then not only be to keep his project within time, budget, and technical specification, but also to try to seek and exploit new opportunities in his project in order to generate additional revenues, to reduce target cost even further etc. but this would also allow him overruns in budget, and time, and lower fulfillment of some technical specifications which have turned out as less value-critical.
How is a project manager to be led and controlled with such a role definition?

1.5 How a company works, precursors to innovation, and a plan for growth

Companies must continually get better at competing in the short term, which requires increasing the alignment among strategy (Bate, 2010), structure, people, culture, and processes to master the efficiency game. For sustainable success a company must also understand and master the dynamics of innovation and organizational change. Success is an impermanent achievement that can always slip out of hand.
Precursors to innovation (Anthony, 2008) are to have control over your existing assets, to operate existing businesses, and to trade declining businesses. What performance gaps do we have? Selling specifically or trading more generally?
A plan for growth means to develop the ability to create new growth businesses. What is the offering we will provide? What customer group can we target? How will we generate revenues? Which suppliers and partners will we use? Visualize a corporation’s goals and boundaries.
Mastering the resource allocation process and consider the rate of growth in the core business and changes in competitive intensity of the core business. Allocate comparative greater resources to such initiatives creating new growth businesses as they navigate unfamiliar territories. Efforts with relatively high asset intensity require more financial and human resources.

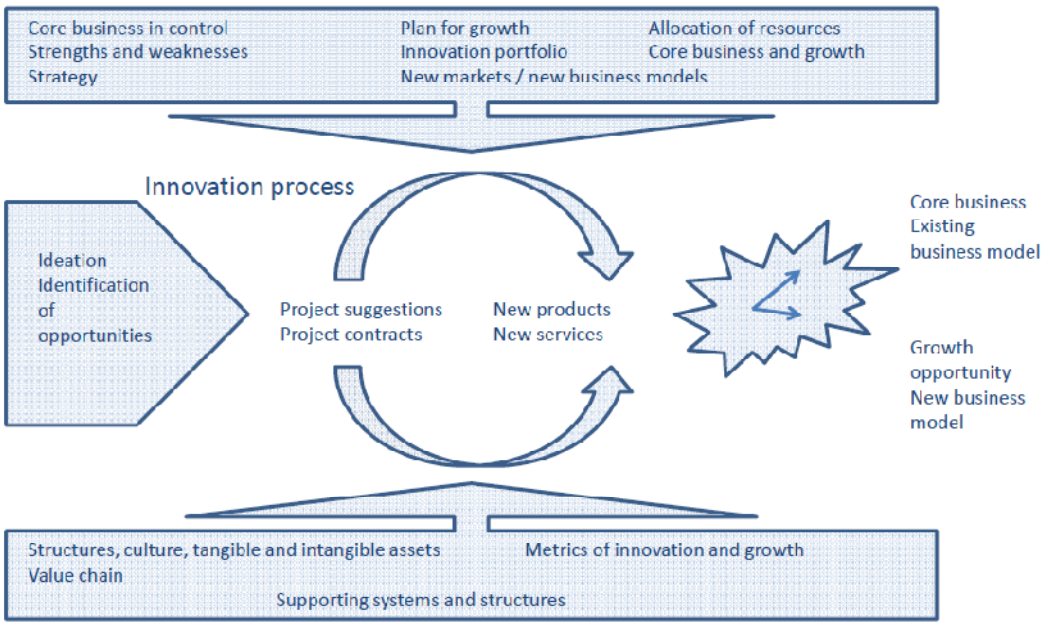


Figure 3: Scheme of business models for exploration and exploitation (Anthony, 2008)

The business model mediates between the technical and economic domains (Chesbrough, et al., 2000). The ultimate role of a business model for an innovation is to ensure that the technological core of the innovation is embodied in an economically viable enterprise. Hence, conducting that process within a successful established firm is likely to preclude identification of models that differ substantially from the firm's current business model. In contrast, a start up seems likely to be both more highly motivated and less constrained in the evaluation of alternative models. Today's successful start-up is tomorrow's established incumbent, subject to the cognitive constraints of its successful business model.

Zott and Amit (Zott, et al., 2008) divide business models of a company into two main categories – novelty-centered and efficiency-centered –business models, and the selection of the model is based on the product market strategy of the company. Their analysis also suggests that a company's business model is a source of competitive advantage, and the business model can be integrated or separated to the company's selected product market strategy.

Markides and Charitou, (Markides, 2004) explore the problem of how a company can adopt two different business models in the same market at the same time. They show that the challenge for a company is to balance the benefits of keeping the two business models separate while simultaneously integrating them so as to allow them to exploit synergies with one another. Markides and Charitou (Markides, 2004) identify five potential conflicts between the company's two different business models: risk of cannibalizing the existing customer base, undermining the value of existing distribution network, confusing employees and

customer about the company's priorities and incentives, shifting from high-value to low-value, and lowering the entry for competition.

Ambidextrous organizations help to compete today and tomorrow. Strategic innovation and the need to create incremental, architectural, and discontinuous innovation require managers to balance contradictory pressures. This means building the organizational competencies to simultaneously host the multiple strategies (Burgelmann, et al., 2009), structures, processes, and cultures needed to be successful today and to create the conditions for discontinuous innovation in the future.

To develop successful innovation, a corporation should establish a conducive organizational climate. Traditional managers tend to adhere more strictly to established hierarchical structures, to be less risk orientated, and to emphasize short-term results, all of which inhibit the creativity, flexibility, and risk taking required for new opportunities. Organizations desiring an entrepreneurial climate need to encourage new ideas and experimental efforts, eliminate opportunity parameters, make resources available, promote a teamwork approach and voluntary corporate entrepreneurship, and enlist top management's support.

Exploration means to develop new knowledge and products, find new ways of doing things, and enter new markets. What are the jobs that customers are trying to get done in the industry? Are customers not served, undershot, or overshot by current offerings? Leadership in disruptive technologies creates enormous value.

Exploitation focuses on exploiting core competences, maintaining current processes, and defending existing market positions. Do integrated or specialized business models currently prevail? Place responsibility to commercialize disruptive technologies in organizations small enough that their performance will be meaningfully affected by the revenues, profits, and small orders flowing from the disruptive business in its earliest years.

1.6 Innovation patterns and product life cycles

This perspective redirects managerial attention from particular innovation toward series of contrasting innovations (Tushman, et al., 2002) that must be produced within a firm over time. Maintaining control over core product subsystems as well as shaping dominant designs and architectural innovation and initiating product substitutes is an innovation management task.

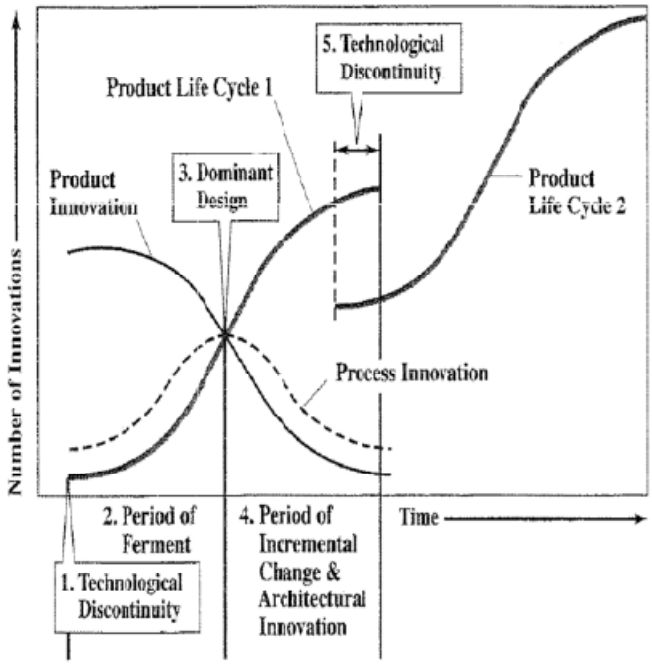


Figure 4: Innovation patterns and product life cycles (Tushman, et al., 2002)

By proactively shaping dominant designs, undertaking architectural innovations, and initiating product substitutes managers can capitalize opportunities to shape technological evolution and change the basis of competition.

2 Exploration, Innovation and Opportunities

2.1 Analysing the strengths of the past and using them to compete successfully in the future.

Flexibility, listening to the market, from copying to exploration, from fast second to innovator, self confidence, working hard and earning enough money, one's own initiative and intrinsic motivation were factors of success in the past. In the face of the current financial crisis times are getting harder.

General managers and corporate executives must constantly look backward, attending the products and processes of the past, while also gazing forward, preparing for the innovations that will define the future. That means to work diligently to exploit existing capability and to explore new opportunities. The failure to achieve break through innovations while also making steady improvements to an existing business is so common place – that it has become a battleground of management thought.

2.2 Assessment of innovativeness

The right balance in the recognition of opportunity and risk is the first task of innovation management. Balance between under- and overestimation is the key.
Under-estimation bias: Radical innovations are perceived as non-innovative.
The decision process will be delayed or never started at all. The started decisions may be terminated quickly or do not receive enough recognition later on (always underfunded shoestring-budget projects). Lost opportunities mean competitiveness decreases, cost-savings or additional revenues are not realized.
Over-estimation bias: Gimmicks are perceived as innovative.
Time waste and wrong budgeting decisions of high-ranked decision-makers or experts occur.
Resources are invested for a problem which could be solved by traditional approaches.
Negative consequences for the decision-making culture: An "innoflation" of the term "innovation" implies that advocates of other minor problems also call for more recognition than they really deserve.

2.3 Kind of innovation - what's new and for whom

Product or service innovation: New functionality, new feature, major changes in performance or quality, major changes in manufacturer's unit cost, or user's cost-in-use, and architecture of systems – modularization, platforms, standardization.
Process innovation: Tangible and intangible processes, core and administrative processes.

Input innovation: New materials, new energy forms, new components, new knowledge, and new properties.
Social and organizational innovation: Social innovation – human being and behavior, organizational, institutional, and management innovations, and contract innovations.
Market innovation: In terms of regions, customers, competitors, regulation, and marketing instruments and business models.

New for whom? New for any individual, expert in an organization, an authorized group of an organization, e.g. its CEO or its board of directors, an authorized group of experts in special institutions. The individuals have to access the radicalness of impact and newness of means.
New Business: Opportunities are developed to create new customers and business models.
New products: Completely new product lines are created to solve previously unmet customer needs.
Marketable innovation: Unique, innovative features are designed to update existing products and present new product attributes to the market place.
Product replacement: Existing product lines are replaced with updated innovation based on key learnings.

2.4 Innovation measurement and impact of innovativeness

Degree of innovativeness				
Technology	Market drivers	Market barriers	Organization	Environment
New functionality	Critical new customer benefits	Attitudinal & behavioral change	Reorientation of strategy	New infrastructure
Quantum leap in performance	Reduction of customer's cost	High learning effort necessary	New structures & processes	Change in regulation / laws
New technological principle	New customers	Change in value chain	New knowledge bases & network	Ethical critique in society
New architecture, materials, components	Growth dynamics of new market	Change customer's regulations	Change in culture	New institutions

Table 1: Degree of innovativeness

Relative advantage and success of a new product depends on its ability to provide benefits or features not offered by alternative products. Innovative products present great opportunities for firms in terms of growth and expansion into new areas.

2.5 The company in the innovation network

Innovation network – open innovation!

Innovation is a process involving multiple activities performed by multiple actors from several organizations, during which new combinations of means which are new for a creating unit, are developed, produced, implemented and transferred to old or new market partners. In supply and value chains, innovation activities are distributed across the participating actors. Innovation of one of the actors can rarely take place without other actors innovating as well. Quick access to new technologies and learning from partners is paramount. Open innovation ideas, inventions, and innovations may be brought into the company from outside and by partners or may be licensed out or freely revealed.

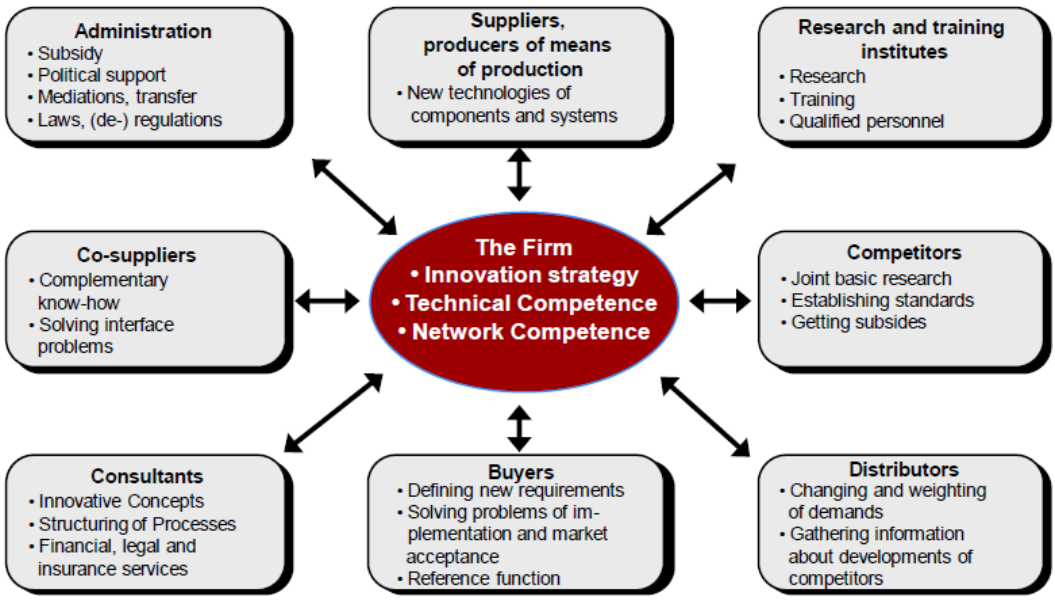


Figure 5: Innovation network of a company

To maintain innovativeness inside the network, it needs to have a strong capability in learning and knowledge management.

2.6 Innovation culture and rewards for innovation

Create preconditions for innovation. Create space for innovation (Singer, et al.), give the people the extra bandwidth and scope they need for creativity. Create an open market for ideas – “innovation democracy”. Utilize the net and IT infrastructure to harness and extend imagination and to let employees collaborate. Combine the advantages of a mechanistic organization with the creative output of organic structures. Social autonomy given through co-locations of teams supports an innovation-friendly project culture, a richer knowledge

exchange, and a higher innovation success. This effect increases with increasing innovativeness.
Most innovative people take pride in creating something new or following an exciting idea that came out of their own head. It's about having the chance to make a bigger difference in the company than they have ever made before and about being recognized for their contribution.

2.7 Evolution or revolution

When seen in accumulation, sustained incremental innovation can have such far-reaching impacts as one radical breakthrough. Such an evolutionary approach does not face the same risks as a large leapfrogging approach. Higher focus on process innovations (Noke, et al., 2010) leads to quality improvements, cost savings, and competitive advantage through high participation of every employee. However there may be the change of missing a disruptive technology and being squeezed out of the market.
Many breakthrough innovations were in fact elegant recombinations of existing technologies and ideas. Radical innovations do not fall from the sky and innovators do not overthrow past knowledge, on the contrary, they build upon it. For example Ford's invention of mass production was a combination of four elements that already existed and had been improved incrementally for years at the time he made use of them. Interchangeable parts, continuous flow production, assembly line, and the electric motor.

2.8 Degree of innovativeness and success

Empirical research does not confirm a direct positive relationship between innovativeness and innovation success (Kock, 2009). The results are mixed, even negative results are found quite often. Innovativeness and innovation success are complex multi-faceted phenomena. Radical innovations (Gemünden, et al., 2009) need more time to be realized than incremental innovations. A high degree of innovativeness offers significant performance leaps or the creation of entirely different performance criteria with new and higher benefits for customer.
The disruptive innovation theory (Christensen, et al., 2004) points out that existing companies have a high probability of beating entrant attackers when the contest is about sustaining innovations. But even well established companies may lose the competitive battle against new attackers who are armed with disruptive innovations that deliver a product or service at much lower cost, and are in addition able to deliver a new functionality and/or quantum leaps in performance.

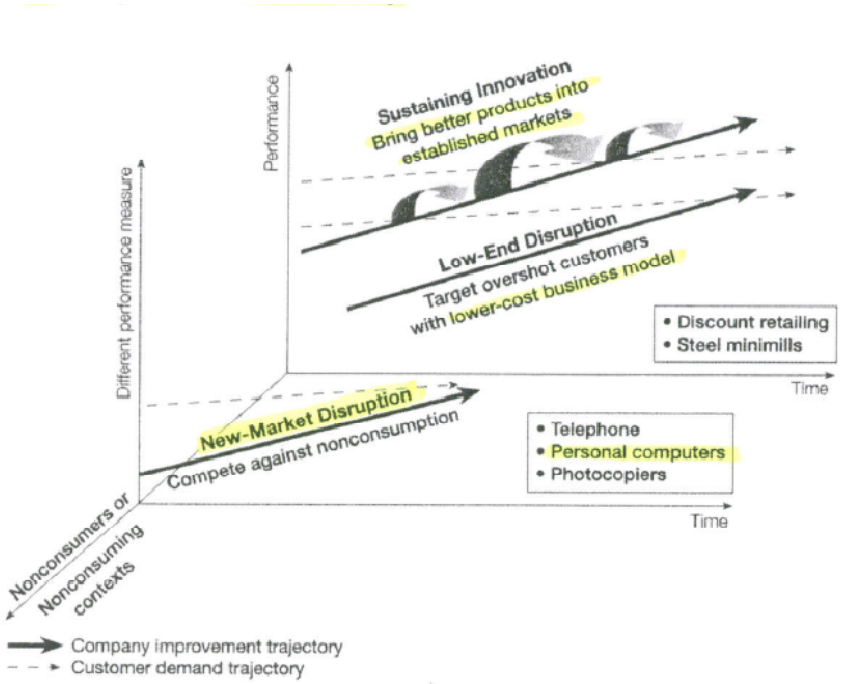


Figure 6: Disruptive innovation theory (Christensen, et al., 2004)

Products and services get better over time. Customer's needs in a given market application tend to be relatively stable over time. Sustaining innovations are improvements to existing products on dimensions historically valued by customers. Disruptive innovations introduce new value proposition. They either create new markets or reshape existing markets. Low-end disruptive innovations can occur when existing products and services are to good and hence overpriced relative to the value existing customers can use. New-market disruptive innovations create new growth by making it easier for people to do something that is historically required deep expertise or great wealth. Disruptive technologies are typically simpler, cheaper and more reliable and convenient than established technologies! Good enough can be great!

Incremental innovations do not offer a great amount of benefit, whereas radical innovations can change markets and replace old technologies. Firms with highly innovative products enjoy great opportunities of establishing a competitively dominant position, expanding into new areas, and securing long term growth. Well known success factors may lose their influence in case of very radical product innovations, they may even show negative influences on innovation success. Internal success factors are project autonomy, process organization, planning and controlling, innovator roles, culture and incentives. External success factors are customer orientation, competitor orientation, launching strategy, and technology cooperation. Process formality – the well known stage gate processes – has a positive main effect – but the stronger negative interaction effect turns this success factor with increasing innovativeness from core competence to core rigidity. Cross functional

teams, early and strong cross-functionally integrated, which are recommended in simultaneous engineering, have a significant negative impact in case of radical innovations, because of in-depth learning between key-persons is hampered. Successfully managed radical innovations typically start with smaller teams, but outpace the less successful ones in team size in the later stages. The importance of customer integration does not diminish with increasing innovativeness, it rather increases. With increasing levels of innovativeness the negative consequences of goal conflicts between supplier and his customer diminish, because more creative solutions, offering win-win-outcomes, are possible – and actively searched and supported by relationship promotors. Innovation management and the relevant decision-makers have to recognize the innovative essence of a decision. They have to organize, how new a product or process should be in order to deserve the label “innovation”, whether a problem should be treated as a “routine” or as an “innovation”, which formal rules and which procedures and criteria should be used and they have to decide about how and when to go or not to go.

The resources, processes, and values theory explains why existing companies tend to have such difficulty grappling with disruptive innovations. Resources, processes, and values collectively define an organization’s strengths as well as its weaknesses and blind spots.

The value chain theory means integrating to improve what is not good enough, and suggests companies ought to control any activity or combination of activities within the value chain that drive performance along dimensions that matter most to the customer. The performance improvements that integration provides come at cost, tend to be relatively inflexible, and tend to react relatively slowly.

2.9 Negative effect of organizational innovativeness.

Organizations which are performing poorer are more willing to take higher risk of more radical innovations. Higher degrees of organizational change are observed in firms which have less favorable starting conditions. There is a longer time-lag and a more diffused effect for organizational innovations than for product innovations. Required changes in organizational structures, processes, networks, values, and competences are not fully recognized, therefore the targeted time and budget goals are too optimistic. Radical innovations have many implications!

2.10 Innovation process inside the Scheuch company

Innovation is the key to economic development of any company. As technology changes, old products decrease in sales and old industries dwindle. Inventions and innovations are the building blocks of the future of any economic unit. Thomas Edison reportedly said that innovative genius is one percent inspiration and ninety nine percent perspiration. There are various levels of innovation based on the uniqueness of the idea. The three major types are, in decreasing order of uniqueness, breakthrough innovation, technological innovation, and ordinary innovation. Breakthrough innovations (also named radical innovations) should be protected as much as possible by strong patents, trade secrets, and copyrights. Technological innovations do offer advancements in the product or market area and need also to be protected. Ordinary innovations (also named incremental innovations) occur most frequently and usually extend technology innovations into better products or services or better market appeal. These innovations usually come from market analysis, the market has a strong effect on the innovation. From a consumer's view point based on the influence of established consumption patterns we distinguish between continuous innovations and discontinuous innovations. Truly new products require great deal of new learning by the consumer because these products perform either a previously unfilled function or an existing function in a new way. From a firm's view point new products are defined in terms of the amount of improved technology, whereas market development is based on the degree of new segmentation.

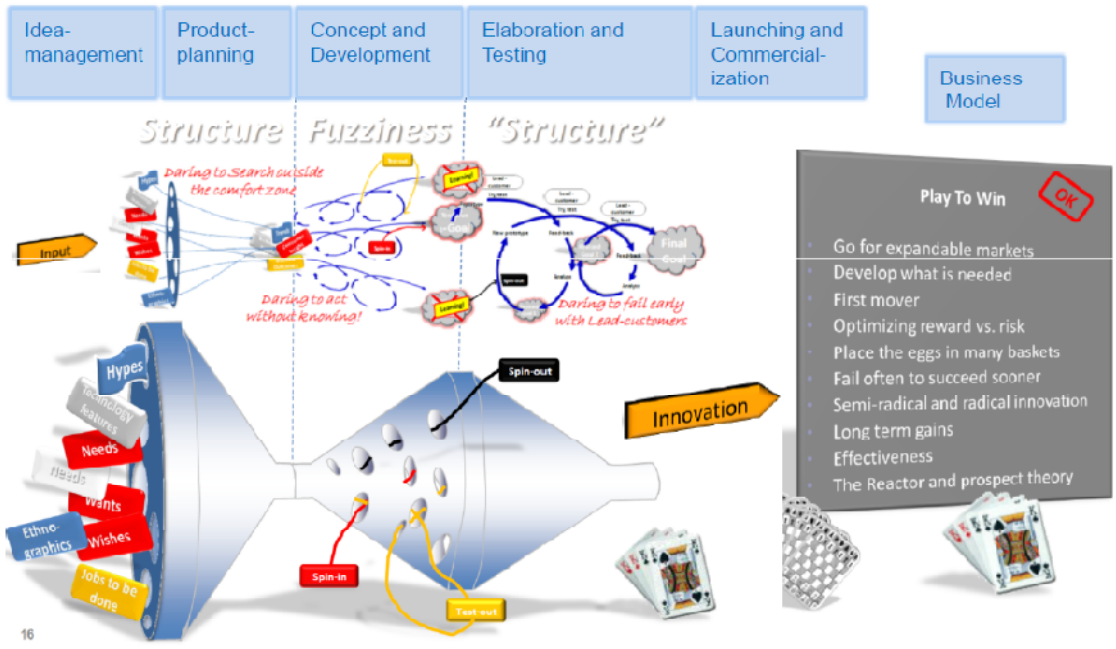


Figure 7: Innovation process at Scheuch

The innovation process at Scheuch is roughly designed and mainly structured for new product development, and differs partially from process engineering development because of different and additional activities for developing chemical and physical solutions and methods.

For new product development in general there are five stages, the submission stage (idea management and opportunity recognition), the product planning stage, the concept and development stage, the elaboration and testing stage, and the launching and commercialization stage.

2.10.1 Idea management and opportunity recognition stage

Sources of new ideas are employees, customers, lead users, user communities, existing products and services on the market, suppliers, federal government regulations, patents, and research and development. Applying entrepreneurial concepts refers to how entrepreneurs discover and exploit opportunities. Entrepreneurial organizations are more like tents, not like palaces, including temporary projects and network-based organizations. Intensity of cooperation with innovating customers should be high. Involvement in some external networks is essential. Through external networks firms are able to improve new product development capabilities, specifically by accessing knowledge, skills and experience that lack. Therefore sustainable competitive advantage is a product of how firms capitalize on the resources of others as much as their own in developing and leveraging unique capabilities. Every innovative idea and opportunity (project proposal) should be listed, described, and carefully assessed. Improvement of idea management can be done by support of an IT system to better administrating proposals and ideas. Commitment of top management and clear determination of responsibility of idea management will bring the company some steps forward to higher innovativeness. Additionally an employee suggestion system should be installed to foster incremental improvements and nurture innovative culture within the company.

Analysis of the steps (Järrehult, 2009) is needed to convert the idea into a viable new product or service. The new product idea must align with the future product portfolio of the company. Examine if the idea is really unique enough to compete and be successful in the market. Market data should be collected so that a trend is apparent for the overall industry. What market need is being filled? We also distinguish between R&D projects in the field of process engineering which are in general technology pushed and new product development projects which are market pulled. Preliminary a technical, a market, and a business assessment, and at last a ROI assumption and a check of strategic fit has to be done and evaluated to pass the first gage. If the idea passes the gate, an approved project order is the result of the first stage.

2.10.2 Product planning and product definition stage

In this stage the first step is to organize the project and the team according to predefined parameters in the project order. A master plan to structure the operating and time schedule, team building, resources commitment from line organization, and confirmation of project objectives are to draw in the kick off meeting with the project team and the awarding authority.

Once an idea emerges from idea sources with a rough definition in the project order of the prior stage it needs further development and refinement. Goals are not “given”, they have to be developed. Criteria for evaluation are to be established in term of market opportunity, competition, marketing system, financial factors, technology factors, and production factors. The determination of market demand is by far the most important criterion of a proposed new product idea. It is helpful to define the potential needs of the market in terms of timing, satisfaction, alternatives, benefits and risks, future expectations, price versus product performance features, preliminary design and manufacturability, and economic conditions. Current competing producers, prices, and marketing efforts have to be evaluated. The new idea should be able to compete successfully with products already on the market by having features that will meet or overcome current and anticipated competition. The new idea should have some unique differential advantage based on evaluation of all competitive products filling the same customer need and preference.

Outcome driven innovation, starting with customer and consumer insides to find unmet needs or jobs-to-be-done, gets you much faster to innovative results than starting with a solution and then looking for the need. Decide on where the strategic areas really are for the company and collect user input into these areas by being out there. Track what is important versus what is satisfied in terms of functional and emotional desired outcomes to identify overserved and underserved areas. Transfer resources from overserved to underserved areas. Failing to take in customer insight early leads to nice technical features being launched in products that solve non-problems, resulting in poor customer acceptance. Interaction between Marketing and R&D – assessment of fit and alignment, internal know-how transfer – is essential for innovation success. Implementation of preliminary research activities is important to harness fundamental research effectively.

The greatest differences between winners and losers were found in the quality of execution of pre-development activities.

2.10.3 Concept and development

In the concept stage the refined idea is tested to determine customer acceptance. Alternative solutions to fulfill the needs have to be tested and evaluated.

Creativity and open mindset to open innovation are basic conditions to find solutions of

higher value. Employees who are involved in the innovation process should be familiar with methods of generating ideas, like brainstorming, brain writing, image and analogy methods, methods of systematic variation, and mapping methods like mind mapping. Flexibility, reversibility, and taking loops for finding better solutions are anticipated in the innovation process. Creative success depends on the personality of the individual who thinks about the solution, the environment and structures which surround the solution process, and the knowledge about the right tools for the solution process.

Driving open innovation to spin in ideas, methods and technologies from suppliers, customers and an outside innovation network, and spinning off ideas, licenses or solutions and commercializing them in another way as the existing business model are signposts for any innovation process.

Does the new concept compare with competitive products in terms of design, quality, reliability and price? Is the concept superior or deficient compared with products currently available on the market?

The manufacturing cost per unit and the amount of capital need to be determined along with the break-even point and the long-term profit outlook for the product. The compatibility of the new product's production requirements with the existing plant, machinery, and personnel has also to be evaluated.

The challenge of the concept and development stage is to go through the gate with a detailed new product concept ready for realization in the next following elaboration stage.

2.10.4 Elaboration and testing

In the elaboration and testing stage rapid prototyping and customer reaction to the physical product is determined. Construction engineering and manufacturing instructions are to be drawn. Product safety and liability, the fulfilling of safety standards and government rules are to be taken into consideration in the same manner as fulfilling customer need. In-house product tests, user tests, pilot production, and pre-tests of market acceptance are to be done. Examination of elaboration and testing activities, financial criteria, review of operations and marketing plans are the challenges to go through the next gate. New product evaluation is done by CTO and principals of the project order.

Launching and commercialization

In the launching and commercialization stage the allocation of requested activities is not fully estimated. In many cases the new product development process is finished after passing the gate of the prior gate. Activities are taken over from the project team to the sales line organization. Last but not least a review over project and product performance, expenditures and timing in comparison to planned data to document the new product development process, the analysis of variances and gaps between actual performance and projected

performance and their reasons, and assessment of the project's strengths and weaknesses has to be done. The definitive last action is the termination of the new product project and to disband the project team.

The launch and commercialization stage is to improve significantly to get a better performance in market introduction. Tight cooperation between R&D and Marketing, training of sales and service staff, planning and plant engineering instructions, and promotion support push the innovation to economic success.

2.10.5 Stages and gates

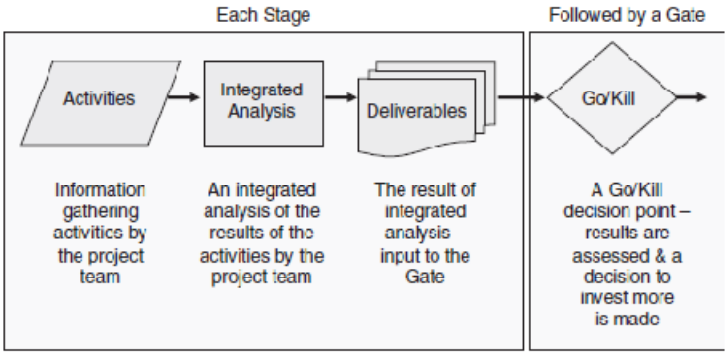


Figure 8: Stages and gates (Cooper, 2008)

Is the gate (Cooper, 2008) at the beginning or at the end of a stage? I argue, that the gate is between two stages and is the decision point for going to the next stage or stopping (loop in the earlier stage or killing the process)! What do the gate keepers need to know to make the go/kill decision? Information only has a value to the extent it improves a decision. Well defined and measurable criteria have to be fulfilled to continue with the next stage.

Some gate keeper rules of engagement:

All projects must pass through the gates. There is no special treatment or bypassing of gates for projects. Gatekeepers should base their decisions on scoring criteria. Decisions must be based on facts like market, technical and business assessments, not an emotion and good feeling.

Gate keepers at Scheuch are the CEO's, CTO and division managers, depending on the project organization. The project team must be informed of the decision, face to face, and the reasons why. It is held accountable for achieving results when measured against these success criteria. At last getting new products to the market quickly and efficiently and winning in the market place are the goals.

2.11 Innovator roles

The management of innovation requires persons who commit themselves with enthusiasm and self-motivation to the new product or process idea. Not one person, rather four persons

should work together and drive the innovation process.
The role of the promotors (Gemünden, et al., 2007): Experienced project leader, relationship promotor (technology related – market related), process promotor. Promotors are defined by the type of barriers they help to overcome, the type of power basis on which their influence is grounded, and the type of characteristic value-creating functions they fulfill by their specific type of behavior.
The project manager is an institutionalized role model to foster innovative projects.
Innovation champions (Chakrabarti, 1974) are defined as individuals who informally emerge in an organization and make a decisive contribution to the innovation by actively and enthusiastically promoting its progress through the critical organizational stages. They pursue innovative ideas, build a network of personal relationship, take responsibility for making the projects successful, persist under adversity, and solve arising problems – but there can also be too much of it.
Power promotors surmount barriers of will through their hierarchical potential. They influence personnel decisions, block opposition, and set priorities and schedules.
Expert promotors know critical details, develop alternatives, evaluate external solution proposals, and implement concepts.
Power and expert promotors within the Scheuch organization essentially influence innovation projects, whether the projects succeed or not by bringing the required information, internal and external resources, soft skills, and motivation of team members.
The process promotor has positional power and knowledge of the organization, knows and links concerned people and experts, steers the process through all stages, and leads and moderates the innovation team.
The relationship promotor has social competence, actively and intensively advances inter-organizational exchange processes through good personal relationships to key actors who dispose critical resources. He keeps the firm's innovation network going, has market based influence and knows players and rules of a market.
The technological gate keeper controls information flow from outside the firm. This role is not very distinctive at Scheuch, as a lot of search for technical information, assessment and storage of information is decentralized. In this field I see some potential for improvement, for better preparation and providing of technical information.
Project leaders have strong influence on the success of an innovation project as he concentrates his workforce on a specific task. There is a controlling effect by not only planning but also implementing critical paths. Identification with the project and creating team spirit as personal success depends on the project success.

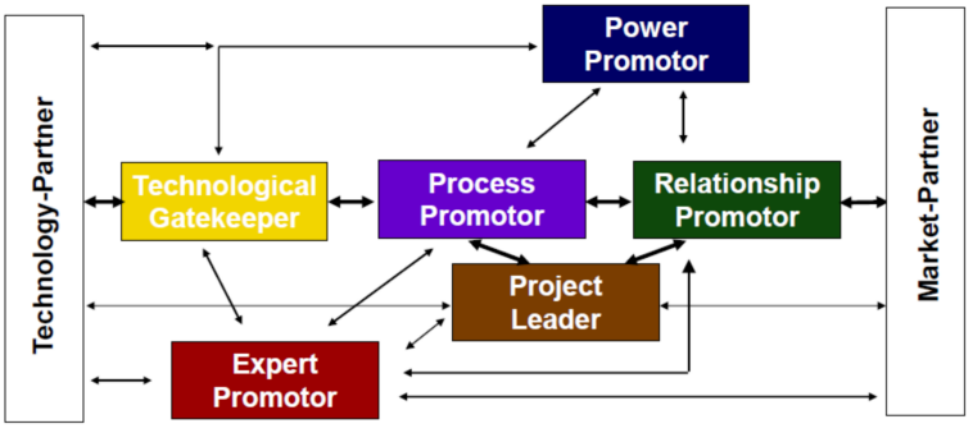


Figure 9: Innovator roles

Different roles should be carried out by different persons. This implies a specialization among different persons, the need for cooperation and coordination, and a struggle for a power-balance of different key persons involved in a coalition for the innovation. Team composition and team leadership have strong impact on teamwork quality and team performance.

2.12 Assessment of success of a new product development project

Project success measures should be made along three independent dimensions:
customer acceptance and customer satisfaction – measurable by revenue growth, met market share goals and unit sales goals;
financial performance – break even time, attains margin goals and profitability goals, return on investment (ROI) and internal rate of return (IRR);
product – technical performance according to specifications, meets quality guidelines.

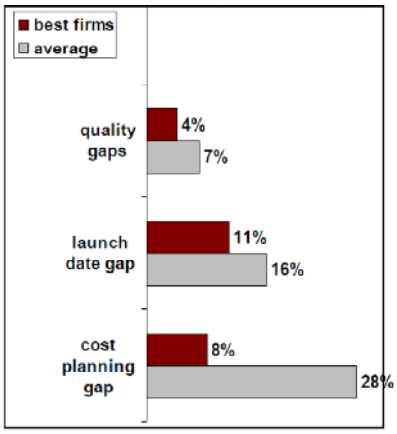
		Input	Process	Output
Project measures	Customer acceptance			- Customer acceptance – Customer satisfaction – Revenue growth – Met revenue goal – Met market share goals – Met unit sales goals
	Financial performance			- Break-even time – Attains margin goals – Attains profitability goals – ROI / IRR
	Product	- Cost of developing the product	- Launched on time - Speed to market	- Technical performance according to specifications - Meets quality guidelines
Program measures				
Firm measures				- % of sales provided by products less than 5 years old

Source: derived from Griffin/Page (1992) — Meaningful measures hard to define here

Figure 10: Assessment of new product development; source: derived from Griffin/Page (1992)

2.13 Key performance indicators

Key performance indicators for successful innovation management are
time to market and time to profit with respect to product life cycle,
time for development and launch,
variation of expected and actual project time,
sales and profits with new products,
R&D expenditures per project or product,
resources for qualification,
quality of products and stability of processes – internal and external claims – downtimes, throughput and utilization,
development efficiency - downtimes, throughput and utilization.
Best firms do have low deviations from original goals of their new product development projects in quality, some more deviations in launch date and most deviations in cost planning, so I assume that quality performance indicators are the most important key performance indicators.



Percentage of projects with deviations from original goals

Figure 11: KPIs for innovation management; source: AT Kearny, best innovator 2006

2.14 Project controlling

The R&D process report has to give a clear picture about time and costs, quality and customer requirement fulfilment, time schedule, and comparison of planned and actual data. It is very important to keep it lean and clearly focused on the goals of the projects, that mean to establish a comprehensive, reliable and valid performance measurement system.

2.15 Evaluation and feed back – learnings

The cybernetic control and learning metaphor

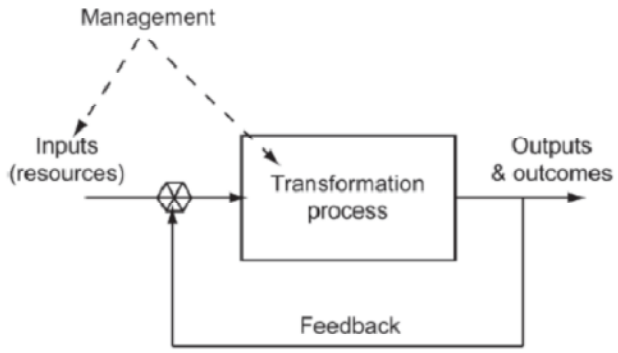


Figure 12: Feedback and learning

Feedback is a very important contribution to the innovation process.
When results are not as good as anticipated, do a leap as soon as possible, as illustrated in the chart of the innovation process. Continuous learning and improvement must be in place: If results are measured and deficiencies are identified but no action is taken, the system never gets better and one keeps repeating the same mistakes. Feedback is presented based on the survey of initial customers, the project post mortem is reviewed, which highlights the projects good and bad points, and the recommendations for improvement from the team are given.

2.16 Multi project management

The firm's strategy determines the mix of projects. Actually we do have more than thirty projects in the funnel. The financing of project costs split to each project is allotted to the five sales divisions. They have to pay for them and expect successful new products, they also pull the projects to their markets.

Project portfolio management optimizes scarce resources with regard to profit, risk, and strategic fit. Program management is not that important at Scheuch, normally we first start a process engineering project to explore and cover basic technologies for applications, second we initiate a new product development project to create new products and replenish the product portfolio. The challenge of operative project management is speed to market, cost reduction, and reliability through good operative project management. Top management's role is to select the right projects, to create supportive conditions that projects can be done

right. The governance system should clearly define the roles, governance rules and decision culture. Top performers empower project leaders and multi project coordinators.
Key performance indicators are actors and roles, incentives, multi project management processes, and instruments and methods.
Key success factors of multi project management are discipline and presence of the top-management, clarity of line management role within the multi project management, design of incentives, strategic integration of project-portfolio management, and disclosure of criteria used for project assessment.
Problems with the multi project management and space for improvement at Scheuch
The multi project management has to take care that projects don't leave the official decision paths, no submarine projects are existent, no new projects suddenly dispatched, no projects are suddenly terminated, or no projects are on the fast lane. Selfishness prohibits long-term project success. If there are inevitable changes, the total project landscape has to be considered and taken care of by mutual dependencies, influences, as well as resources allocation of the projects. Collection of up-to-date information providing visibility of the entire project portfolio is to be improved for better communication of the status and performance metrics. Problems with implementation and the enforcement of priorities have to be communicated clearly to foster rapid and adequate decision makings and to avoid discord under the project principals.

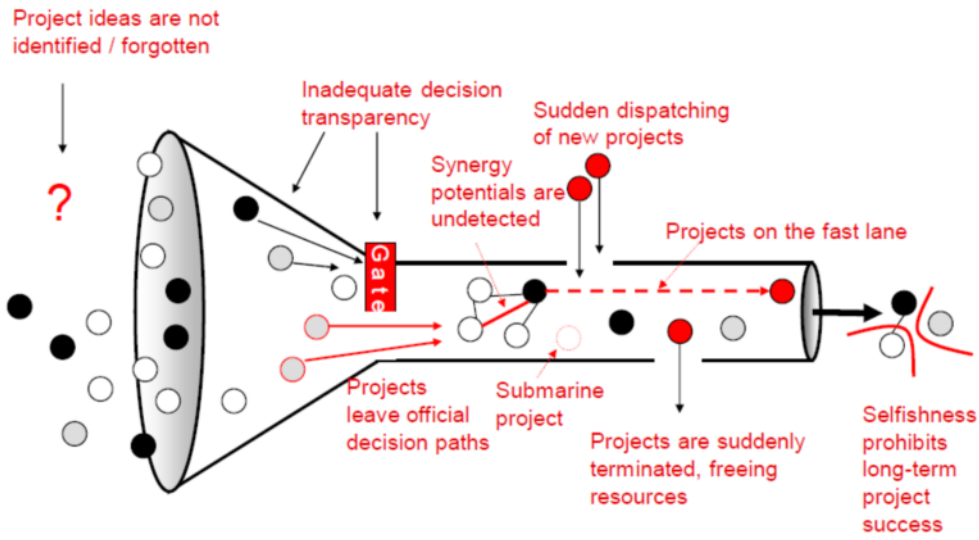


Figure 13: Multi project management

Division managers are the principals of new product development projects. They have to invest capital and often try to gain revenues in the short term. So long term aspects sometimes fail.

The challenge of multi project management at Scheuch is to balance short-term and mid-term goals and how to prioritize in case of conflicts. Discipline and presence of top management, clarity of line management role within the multi project management, and strategic integration of project-portfolio management are key success factors.

2.17 Organization of innovation

Most of the new product development projects have matrix organization at Scheuch, so resource allocation is often a problem because of the divergence of tasks of the project team and the tasks of the line organization to accomplish every day's work. Involvement of many people from different organizations, different departments and different levels – they need to be coordinated, motivated and funded.

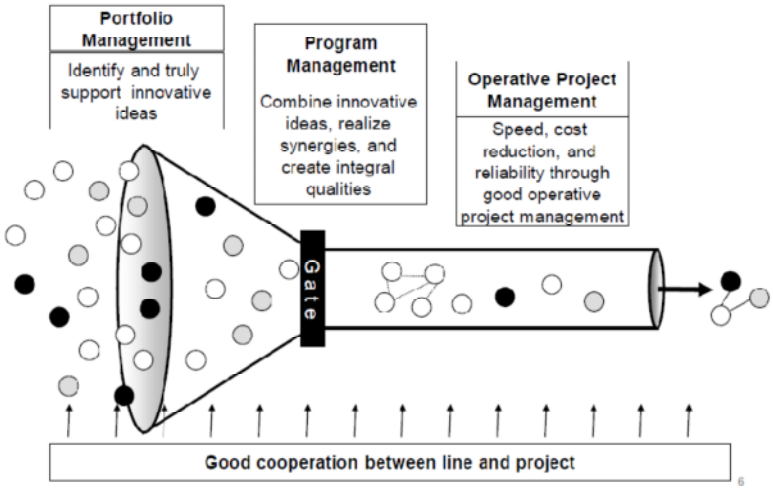


Figure 14: Portfolio, program, and operative project management

Clear understanding of the roles of project and line managers is important for project success. Not only the team, also the team environment and surroundings (line organization) have big influence on efficient working of teams.

Cross-functional teams with critical players from different parts of the organization are beneficial, one champion leads the team in entrepreneurial fashion. Create entrepreneurial teams to run the breakthrough areas of the firm and promote more efficiency-oriented, cost-focused managers to run the mature product areas.

Organizational structure of new product development projects should differ, depending on the degree of innovativeness of the project. For incremental innovations matrix project organization fits best. For more sophisticated projects and for break through (radical) innovations Scheuch should use pure project organization to have full concentration on the

project. I agree, that project oriented management systems with high authority of project leaders are more successful.

Figure 15: Project organization

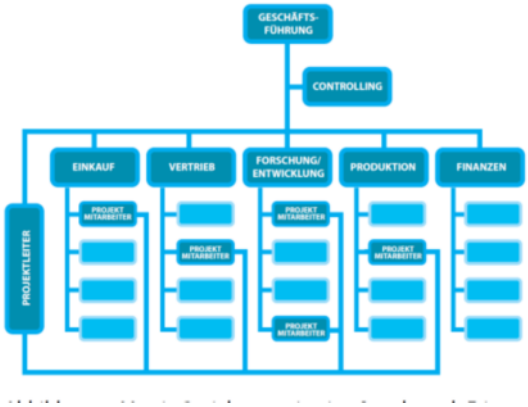


Figure 16: Matrix project organization

Ambidextrous organizations in dynamic environments help to achieve short-term goals, supported by independent teams and efficient allocation of development resources to master exploration. Management has to master the dilemma between stability and incremental innovation in the existing business and exploration of new possibilities and disruptive changes. Combining the advantages of a mechanistic organization with the creative output of organic structures is necessary. Some divisions like manufacturing and mature product lines may be larger and more mechanistic, some divisions like R&D and new product lines may be small and organic. Spinning-off the innovation to organic-lead parts is in order to avoid interference with the mechanistic organisation and to pursue both, exploration and exploitation.

2.18 Team work and success of innovative projects

Innovation is a team sport. Activities, interaction (frequency and intensity), sentiment (human emotions, motivations, or attitudes) have influence on output and success.
Team work quality (Högl, et al., 2001) depends on communication, coordination, balance of member contribution, mutual support, effort, and cohesion.
Team performance is determined by effectiveness (quality) and efficiency (schedule and budget).

Personal success results in work satisfaction and learning (knowledge and skills).

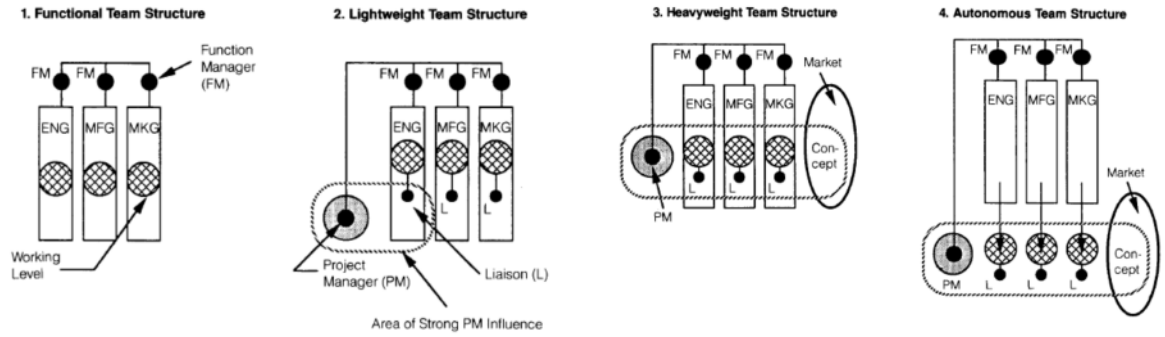


Figure 17: Types of development teams (Clark, et al., 1992)

One strength of functional team structure (Clark, et al., 1992) is that those managers who control the project's resources also control the task performance in their functional area, but coordination and integration can suffer as a result.

In light weight team structure still residing with the subfunction and functional managers, hopes for improved efficiency, speed, and project quality are seldom realized. Subfunctions capture the benefits of prior experience and become the keepers of the organization's knowledge while ensuring that it is systematically applied across the project. A light weight project manager remains under the control of their respective functional manager, does not have power to reassign people or reallocate resources, and spends normally less time on one project.

In contrast a heavy weight project manager has direct access to and responsibility for the work of all those involved in the project. He has primary influence over the people working on the development project and supervises their work directly. The core group of people is dedicated and physically co-located with the project leader.

An autonomous team structure means that formally assigned individuals from the functional areas are dedicated and co-located to the project team. The project leader has full control over the resources contributed by the different functional groups. Autonomous teams can excel at rapid and efficient new product and process development.

Identifying with the product and creating a sense of esprit de corps motivates core team members to extend themselves and do what needs to be done to help the team succeed. Whatever actions the organization takes, the challenge is to achieve a balance between the needs of the individual project and the needs of the broader organization.

2.19 R&D centralized or decentralized is often discussed at Scheuch

Decentralized activities sometimes lead faster to results because of more flexible organizations and rapid decision makings. But on the other hand information often gets lost for other divisions or activities are done twice the same. Centralized R&D activities foster tight coordination and economies of scale, avoid redundancy, develop core competencies, standardize and implement innovations throughout the firm. Regarding the Scheuch company's size we foster centralized R&D organization to have concentrated knowledge and coordination. All assignments evitable for more than one division have to be centralized structured, only a few constituent activities for one division are decentralized.

Create innovative culture - embed innovation in the organization as a core competence. Intrapreneurship instead of stewardship; invest in people, initiate courses and training, radical ideas should not be "killed" too early, accept failures, foster, find and use creativity inside the company, use "channelling" ideas by a formal system, provide "internal venture capital" for particularly innovative and risky ideas, …

The organizational culture gives all organization members a guideline for their future behaviour. The culture of Scheuch should support generation of innovations, autonomy, self responsibility, risk tolerance, and achievement motivation should be attendant.

Democratized innovation allows all employees of a firm and participants of a business process to innovate and to reveal innovative ideas; but also customers, users, lead users, and innovation communities are able to participate

Intrinsic motivation is given in successful innovations as most innovative people take pride in creating something new or follow an exciting idea that came out of their own head. People should have understood, that every idea is needed – value simply is playing the game.

3 Proposal to Improve Exploration

Some of the more frequently used sources for the company include consumers, existing products and services, distribution channels, the federal government, and research and development. Entrepreneurs pay close attention to potential customers. This attention can take the form of informally arranging for customers to have an opportunity to express their opinions like on trade fairs, exhibitions, seminars for professionals, and meetings in the context of normal business. We also should establish a formal method for monitoring and evaluating competitive products and services on the market. This analysis may uncover ways to improve on these offerings that may result in a new product or service that has more market appeal and better sales and profit potential. Members of the distribution channels are also excellent sources for new ideas because of their familiarity with the needs of the market. Not only do channel members frequently have suggestions for new products, but they also can help in marketing the new developed products. New product ideas can come in response to government regulations like rules for emission control nowadays. Also the files of the Patent Office contain numerous new product possibilities. We should build an agile company based on a firm believe that creativity will thrive the company. Learning how to be more creative is like learning any skill, you gain expertise over time. The goal is always to find a way to tap the creativity of everyone in the company. Research and development, our efforts are sources of new ideas.

SWOT Analysis of exploration capabilities at Scheuch shows the potential for improvement.

SWOT Analysis		intern	
		Strengths	Weaknesses
extern	Opportuni-ties	Collaboration with lead users to develop and commercialize new technologies Resource allocation for R&D Configuration and Customization of solutions - standardized plant engineering, products, and services Networking to legal authorities Continuous improvement of new product development process - well defined goal of innovation projects – meeting customer needs – right budgeting – established rules and methodologies – engineering and design Product portfolio management, technology fit and leveraging of core competencies into new products	Corporate foresight Idea generation - fuzzy front end Collaboration of R&D, marketing and sales - fuzzy front end – at the end of the funnel Project management, stage-gate methodology in the new product development process, try and learn process The role of project owner – power, skills, network, and communication Organization of innovation – team work Resource allocation and the role of technique team Internal promotion of innovation Preannouncement and launching of innovation – product management – competitive awareness, pricing, promotion, and training of sales personnel
	Threats	Value chain to sustain and develop core competencies, to keep down cost of performance of new products and to allow aggressive pricing Competitors, fast seconds Place – manufacturing – high costs – well educated employees and engineers Strong appropriability regime – patenting of own ideas and solution approaches Political effects Market demand – disruptive technologies	Radical innovations – new technologies, low cost appliances Give a chance for start ups and new business models - consequence of fixed market segmentation and internal processes Mature products in a market with high rivalry – product lifecycle concept Internationalization – lack of knowledge and hands-on experience - implementation of strategy – learning of foreign languages and cultures Low budget for product and process innovation – less standardization, low degree of full completion – less flexibility, long lead time for customer orders, high follow up costs and resource occupancy Marketing is more than communication Collaborators – imitators

Table 2: SWOT Analysis of exploration capabilities at Scheuch

3.1 Corporate foresight

The horizon of Scheuch company's strategy comprises a maximum of 5 years. To ensure a long lasting development of Scheuch it is required to take into consideration the next five to fifteen years. Inventing the future means to be careful about new customer requirements, new technologies and new products and markets, finding pictures of the future.

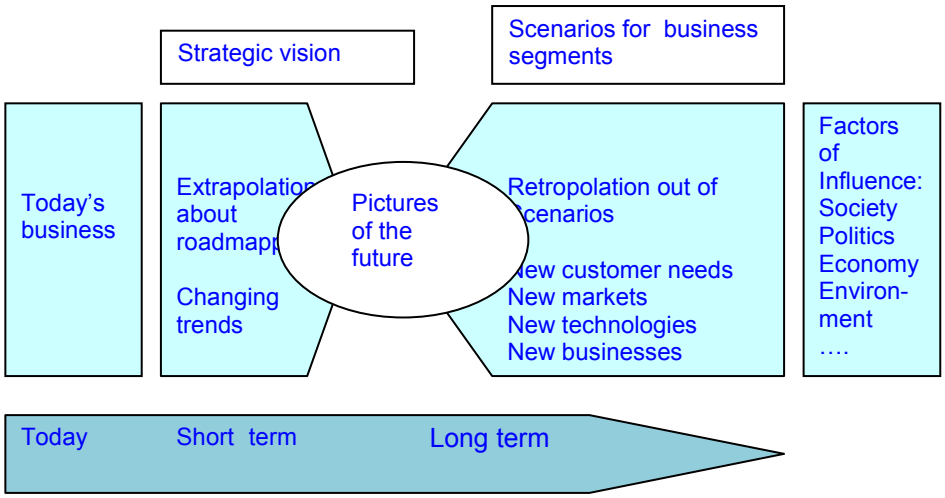


Figure 18: Corporate foresight

By extending the activities within the strategy process by forecasting methods as monitoring/scanning, delphi analysis, and scenario analysis preferably rooted in R&D to influence strategic orientation, a long term success is ensured.

Corporate foresight: Which changes happen in the industry? Should we redefine our business concept? There is institutionalized generation of new knowledge about the future.

3.2 Idea generation and the process of identifying opportunities

The lack of an idea management system hinders the effective start of new projects. An integrated idea management system enables capturing and implementation of internal and external ideas to bring them to valuable project proposal, and to file and submit the proposals in order to start new R&D or NPD projects. Cross linking of idea contributors all the way to top management enables democratizing of innovation. There is a general trend toward an open and distributed innovation process driven by steadily better and cheaper computing and communications to increase potential for innovation. Information and communication technology enables strategic innovation, the company suggestion scheme, and bringing ideas into viable projects. The innovation cycle is moving faster and the challenge is to

identify customer needs, benefits, and the conceptual features that are envisioned for the product.

3.3 Interaction between R&D, new product development, and marketing

Interaction needs between marketing, R&D, and new product development are given.
The idea that a new product suddenly emerges from R&D – like a chicken from an egg – is simply incorrect. In fact, techniques are applied from early idea generation and concept evaluation to positioning, market testing, and launch management.

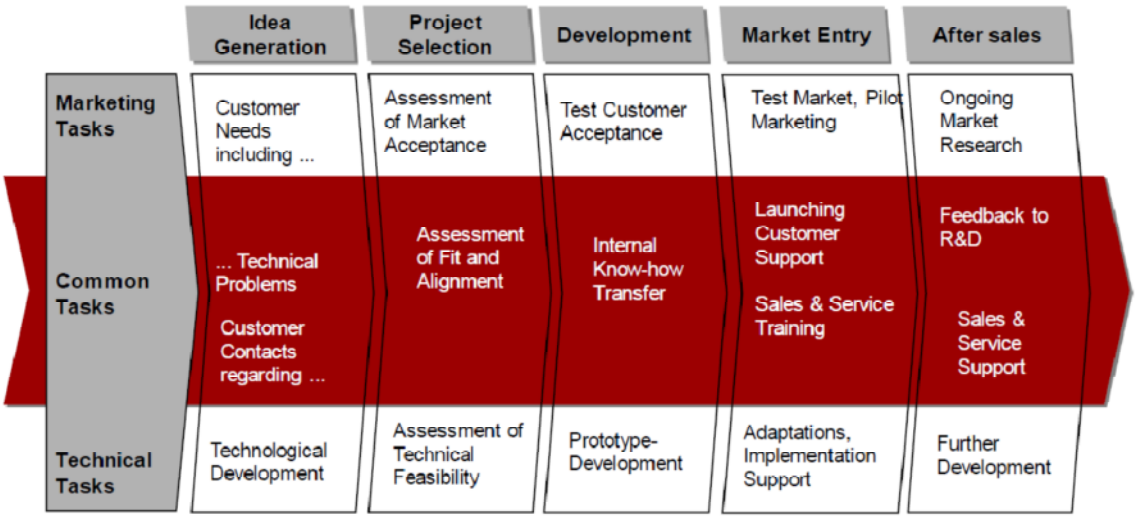


Figure 19: Interaction between R&D, new product development, and marketing; source: Trommsdorf

3.4 Cooperation between R&D and marketing at the fuzzy front end

Cooperation between R&D, product development, and marketing in the idea generation stage, in the product planning stage, and in the product definition stage is essential for every new project. Outcome driven innovation has to explore and estimate customer need. Open innovation, networking, and partnering to bring in new ideas and information from outside the company. A formal integrative management process is required to support cooperation and teamwork to convert specifications into designs.
Whether the innovation is incremental, distinctive, or breakthrough should be determined by the future needs of the market. Effective targeting must include analysis of developing

customer needs, emerging technologies, the total competitive environment, internal capabilities, and basic organizational goals. An efficient organization has both formal and informal mechanisms to properly align these elements and convert the analysis into productive innovation programs.

3.5 Marketing of innovation at the end of the funnel

A hallmark of this field is the regrettable fact that product innovation (like all innovations) must be pushed. Innovation is an unnatural human event. As individuals and as organizations, we build roadblocks again and again. So, new products managers have to spend a major share of their energy just opening doors to change. We have to have innovation champions vested with power, skills and communication abilities to succeed in new product developments. Internal marketing of innovations boosts the projects and enables them to get the required advertence and awareness they need to succeed. Spend what it takes to get immediate market awareness. Extensive user involvement captures the “voice of the customer”.
Cooperation between R&D and marketing in the launch and commercialization stage.

- Product; differentiation,
- Price; cost leadership, target costing
- Promotion; value creation and satisfaction for the customer
- Distribution; sales training

3.6 Identification of market opportunities for technologies

Scheuch by nature is a market driven company. The interests of our customers are thereby the focal point of all our considerations as we strive to find the best technical and economic solutions to meet their needs. We do this so that every customer can make long-term investments knowing that the underlying technological concept will stand the test of time, the equipment can be retrofitted or converted as technological advances are made, and that cost reductions can be achieved while simultaneously increasing performance and safety levels. The result has been close and responsible working relationships culminating in long-term partnerships characterized by our joint efforts to achieve again and again a new level of technical and economic optimization. Marketing and sales experience is essential to discover new market applications and leveraging technological potential into new opportunities and new business segments.

3.7 A map of innovation projects and strategic alignment for the future

Overview of innovation landscape, programs, and projects to show the actual situation and gaps for future alignment.

	Incremental innovations small improvements in existing products and operations	**Architectural innovations** technological or process advances to fundamentally changing a component or element of the business	**Discontinuous Innovations** radical advances that may profoundly alter the basis for competition in an industry
New customers	**Number of projects: 2** - Low temperature applications for Russian (Eastern Europe) market - Adaptations for the North American market	**Number of projects: 1** - Industrial fan applications for new customers	**Number of projects: 0**
Existing customers	**Number of projects: 12** - Ligno compact filter - Sefc electrostatic precipitator - Pneumatic conveyor system - Exhaustion system - Radial fan measures - Optimization of high voltage precipitator system - Fipp process filter for separation of high dust load - Sef electrostatic precipitator 6,6 to 12,0 - Efv electrostatic precipitator with integrated cyclone preseparation - Wear protected impeller of industrial fans - Standardization of steel constructions with gangways and stairs - Pulse master filter control system	**Number of projects: 8** - Firg filter for energy industry - Zsm rotary valve - Axial fan for cooling system - Dosing feeder with humidification - Control system for exhaustion systems in the wood industry - Ligno filter - Fim new medium sized filter generation - DeNOx catalytic treatment of exhaust gases	**Number of projects: 1** - DeCONOx catalytic treatment and integrated regenerative combustion of organic pollutants of exhaust gases

Table 3: Innovation projects at Scheuch

3.8 Clarification of the role of project owner / project management and portfolio management skills

The Technique Team at Scheuch has the function of R&D and new product development program management and project coordination and consists of CEO, division managers and CTO.

Division managers at Scheuch are the principals of market driven R&D and new product development projects. They have to realize project-related company interests and to provide a project proposal. After checking the strategic alignment of the proposal and prioritization of the proposal by the Technique Team, the proposal has to fulfil technology, market, and economic related criteria to reach the status of a released project proposal.

The role of project owner is important in the program and project management process and should be well considered. To develop the maturity of project owners, appropriate structures must be created and the awareness of the role must be increased. Therefore there has to be clearness on perception, on competences in project management, and appropriate relationships to relevant environments. Through adequate process development of the project oriented company, the understanding and acceptance of the role can be supported. The management quality in projects or programs has to be assured and to be improved through consulting activities and training. Networking and the share of experiences and information should nurture the benefit for all. Project data are stored in a data base and serviced by the project leader to ensure project controlling and reporting the status of each project every two months to the Technique Team.

The project owner has to play a dominant role to foster his project, to get the adequate resources in times of scarce resources in general nowadays, to act like a power and relationship promotor to guide and support project management, networking and promotion.

	Role of project owner
Objectives	Submit R&D and new product development project with defined tasks and objectives Realize project-related company interests Assign the project to the project team Support the project team
Position in the organization	Member of Technique Team Member of 1st or 2nd level of management
Tasks	Agree on objectives with the project team Participate in the start workshop Contribute to the project marketing

Tasks	Make strategic project decision and promote change in the project Decision making in stage gate process Project controlling Define a project discontinuity or end a project discontinuity Collaborate in the development of and decisions about immediate measures Collaborate on the performance of corrective measures and checks on their success Performance evaluation Participate in the project close-down workshop
Formal authority	Formal project approval Changing of the project objectives Project stopping

Table 4: Roles of project owner at Scheuch

It is the purpose of the project that spells out precisely how the benefits will add value to the firm.

3.9 Organization of innovation and team work

Functional project teams have to manage too many projects, and too much operational work concurrent. The duration of projects is too long and efficiency decreases with the increasing number of projects for a team. Scarce resources because of doing operational work have dramatic negative influence on the success of the project team work. So the goal is to change organization and resource allocation.

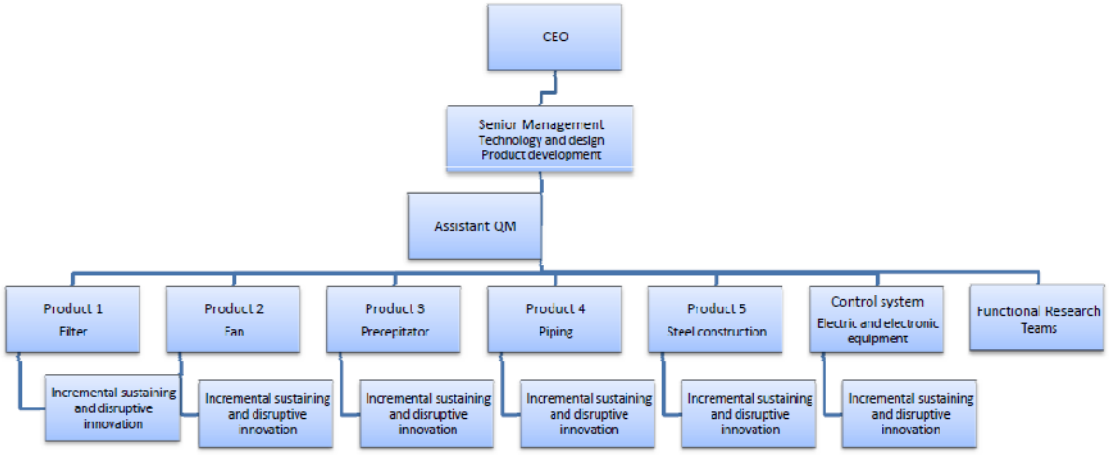


Figure 20: Current organization for innovation at Scheuch

A shift from light weight project teams to heavy weight project teams and independent project organization for discontinuous innovations to avoid cannibalization of project work by “urgent” line work should improve project team work.

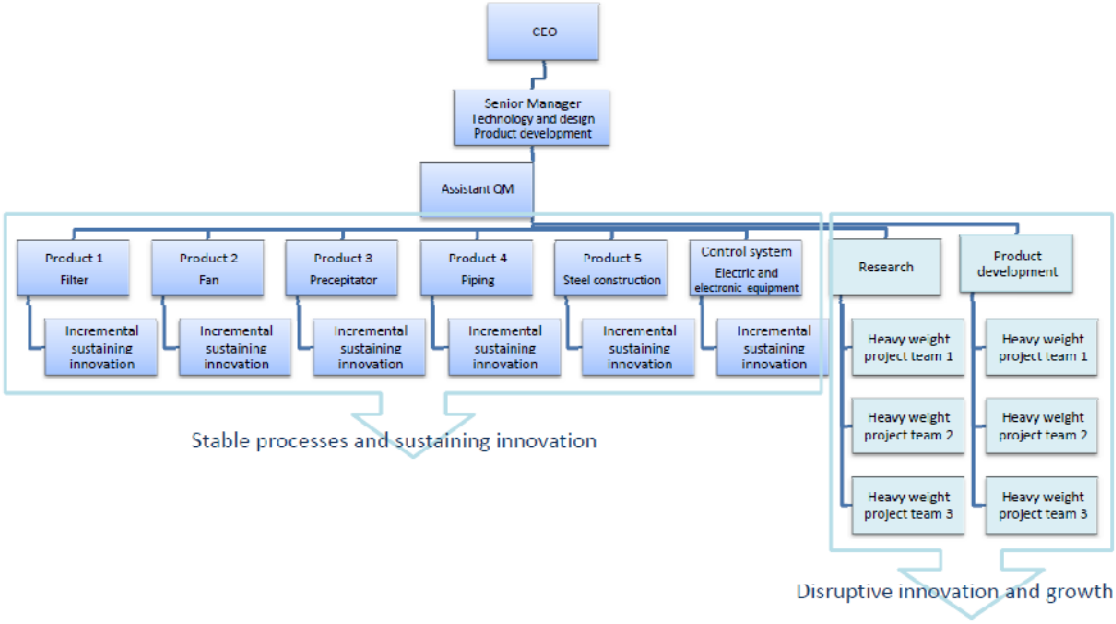


Figure 21: Ambidextrous new organization for innovation at Scheuch

3.10 Resource allocation and the role of the Technique Team

Clearance about allocation of personal resources for project work, especially when needed quantity of resources varies during the project run time, is crucial. A vision on far future business is important but does not have relevance for resource allocation at the time.

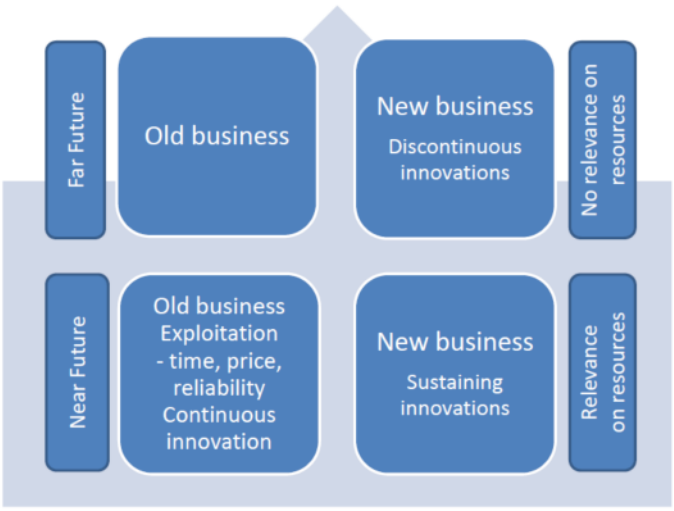


Figure 22: Relevance on resources; source Gemünden

The Technique Team is a management board existing of two CEOs, one is responsible for marketing and sales and the other for engineering and manufacturing. There are five sales division managers and the technical director, responsible for R&D and new product development. Annual budgeting of expenditures for R&D and new product development depending on planned revenues and the company's strategy goals and budgets is fixed for each of the five divisions. Every second month meetings of the Technique Team assure the controlling of all current projects and setting measures if time, cost or content run out of planning. At this time too many projects are done concurrently.

So it is task to find a way to prioritize a few projects, to build heavy weight project teams to concentrate on these projects and to accomplish them in an efficient way, within time schedule and budget. A team should do only one project or maximum two projects simultaneously to speed time to market.

The role of the Technique Team is first prioritization of projects and resource allocation, second project controlling, and third at the strategic level to bring new ideas and opportunities to a valuable new project.

Innovation process and project management have to be aligned. The project management prepares the gate decisions, decisions are taken by the Technique Team, and the gate decisions drive the project management process.

In a dynamic environment the resource allocation has to adapt to changing conditions.

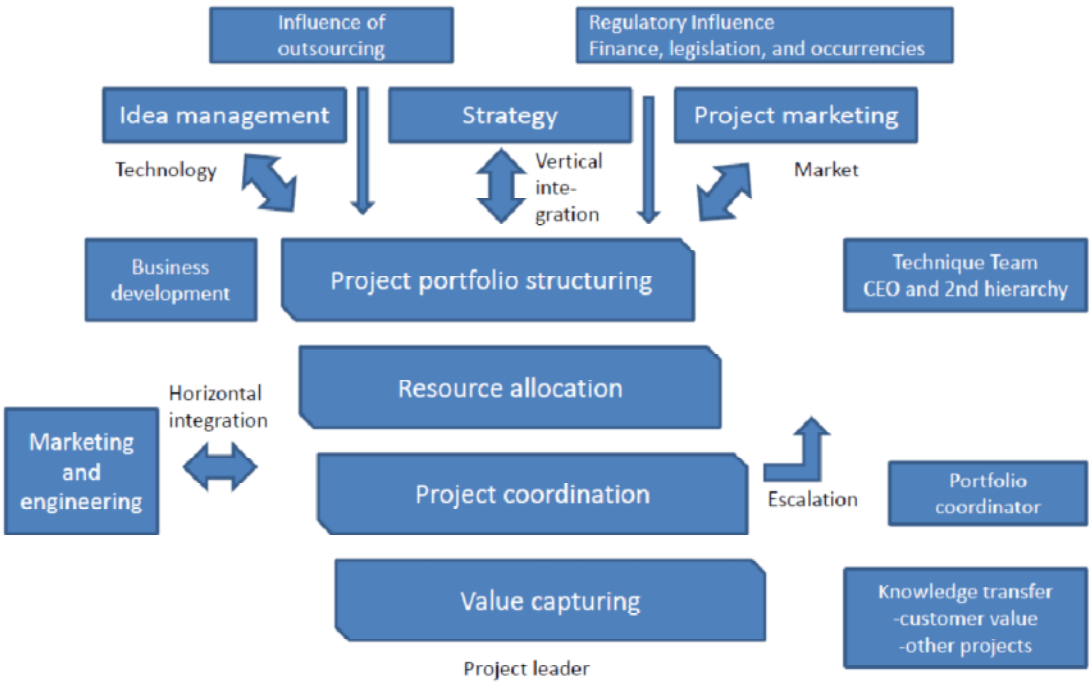


Figure 23: Dependancy of resource allocation; source Gemünden

3.11 Scarce resources, postponement of detail engineering and reduced development efforts have negative influence on quality of exploitation of innovations.

Some important new product development projects are not finished completely. As full development capacities and capabilities are not available, the innovation process is interrupted after the concept stage, passing the gate but then are not or only partially further executed. Pricing and Promotion is done, so it is possible to bring the new product to the market, but its detail engineering and preparation for manufacturing will only be done in case of customer order. Modularization and customization of new products and services allow such strategies to keep expenditures low in the early phases of development. The consequences of reduced product development activities are longer lead time, inefficient detail engineering and higher customer order efforts and operation costs. The difficulty lies in actually offering new value propositions in ways that make economic sense. New or adapted information and communication technologies are essential to product and service offerings, to provide the underlying infrastructure of the value chain, to develop proprietary technological solutions, and to serve customers in the very best way. Software development is a driver of value to existing and new customers, not just as a tool for operational efficiency. The more effective way is good planning and completion of the whole innovation project from the kick off, the achievement of the set goals to draw down and quit the project successfully.

3.12 Create space for innovation and innovative culture

Create space for innovation and give the people the extra bandwidth and scope they need for creativity – and create an open market for ideas – democratize innovation. Work pressures decrease employee's creative search for new insights and thus should be reduced to achieve innovations (Amabile, 2002). Foster networking and open innovation. Entrepreneurial leadership and innovation management have to foster innovative culture and innovation ability. The innovation process is a standardized process – methodology – to let effective innovations efficiently happen. Long-term innovation involves linking innovation streams, market requirements, and organizational capabilities. Managing innovation involves linking diverse competencies across multiple boundaries, executive teams must manage organizational processes down within their units, across with their peers, up with more senior managers, and outside the firm with important suppliers, vendors, alliance partners, and customers.

Scheuch has a functional structure with clear defined tasks and responsibilities. Project teams with members from different functional lines develop new products. There are always tensions between line tasks and project tasks.

Building a culture of intrapreneurship and creating an organization that finds new opportunities as a matter of course is required. Becoming intrapreneurs – persons within a large corporation who take direct responsibility for turning an idea into a profitable finished product through assertive risk taking and innovation, like a *heavy weight product manager*.

It is necessary to build a flat organization with loose hierarchical control to improve the innovation process and to foster idea generation. Employees should be encouraged to be creative and to look for new ways to improve the current way of doing business. Innovation must happen outside routine business operations. Innovation is a new combination of needs and a technical solution; it usually requires cooperation of many actors. It is vital to enhance access to power tools like information, resources, internal support and external context for innovative problem solving.

It is essential to look for ideas from outside with market vision and customer insights instead of trying to develop everything from within. Collaborate and develop new solutions with partners, customers, and suppliers. The challenge is to link people and ideas to lucrative business opportunities.

4 Exploitation – Business Models

Companies must strive for efficiency, which requires rigorous financial controls. They must also be innovative and entrepreneurial, which requires autonomy and loose, flexible controls. A manager and his team need to be clear about the strategy, objectives, and vision of the performance of their organization. The difference between expectation and actual performance constitutes the performance gap which they have to diagnose and resolve. Maximizing current performance requires strategies that exploit resources and capabilities across different markets. Success for the future is dependent on the creation of new resources and capabilities and their deployment in new markets. Innovation, efficiency, and responsiveness require autonomy for business-level managers. The competitive advantage of the multi business corporation ultimately depends on integrating resources and capabilities across businesses. It should be possible to mesh the resource advantage of a big corporation with the responsiveness and creativity of a small enterprise. Loosening the structure may be a critical step forward building the ambidextrous organization – one that combines multiple capabilities and accommodates both gradual change and evolutionary change as well as occasional revolutionary leaps.

4.1 Business model

A business model is the foundational architecture of a business, describing in sum how a number of key pieces of the business system fit together. A business model can be defined by six basic components (Morris, et al., 2005): the value proposition (offering), the target market (customers), internal processes and competencies (value chain), the competitive strategy, the generation of revenue (earning profits), and the entrepreneurial factor (goals of the firm).

The ultimate role of the business model for an innovation is to ensure that the technological core of the innovation is embodied in an economically viable enterprise to capture value from innovation. The business model is a construct that mediates the value creation process. It translates between the technical and the social domains, selecting and filtering technologies, packaging them into particular configurations to be offered to the market. Because both technical and market uncertainty are involved in this translation, the set of all feasible business models is not foreseeable in advance. Since heuristic logic is employed to discover an appropriate business model, that “sense-making” task will be constrained by the dominant logic of an established organization. Hence, conducting that process within a successful

established firm is likely to preclude identification of models that differ substantially from the firm's current business model. In contrast, a start up seems likely to be both more highly motivated and less constrained in the evaluation of alternative models. Managers should be aware, of course, that today's successful start-up is tomorrow's established incumbent, subject to the cognitive constraints of its successful business model.

Business model innovation (Johnson, et al., 2008) often powers disruption. More often than not, the true disruptive power of an innovation lies not in the features and functionalities of the offering, but in the business model that encases the product or service. Successful disruptors have the ability to make money at low price or to serve a small market profitability. Or they play in a very different value chain, with new partners, suppliers, and channels to market.

Target group and value proposition (Which customer problem is to be solved?)	International plant technology business, consultant, supplier and end user; Plant engineering, delivering, construction and commissioning	Five industries around the world Best available technology for gas cleaning, dust separation, and heat recovery
Strategic positioning	Hybrid strategy: Excellent technology and market usual price	Advantage of integrated development and manufacturing of core components
Value chain design	High vertical integration degree and global purchase	Single source
Organizational structure and core processes	Divisional structure in sales, functional structure in engineering and manufacturing; standardization of processes	Plant engineering, manufacturing, delivering, construction, commissioning, and after sales service
Product strategy	Development of core technology and development and manufacturing of core products in house	Innovation leadership and efficiency, operational excellence
Pricing strategy	Aggressive pricing to increase revenue and ensure planned growth rate	High volatility
Communication strategy	One face to the customer	Long-term and personal relationship
Distribution strategy	Collaborate with international acting partners	Partnering with international plant engineering and construction firms
Revenue generating mechanism	Turn key service, flexible pricing and quantities to match demand with supply	Consulting, engineering, delivering, commissioning revenue sources are flexible

Table 5: Core elements of a business model for plant engineering and construction

4.2 Existing business and growth

It came out very clearly during the financial crisis and decreasing revenues, that fixed costs maintaining complete product portfolio influence earnings considerably. Cost cutting is not an applicable method as a lot of jobs that had to be done were not accomplished and later on, the jobs had to be accomplished due to customer orders. It is important to keep the business growing and thus match fixed costs of an existing product portfolio and new developed products. Organizations achieve superior performance (Magretta, 2002) when they are unique, when they do something no other business does in ways that no other business can duplicate.

4.3 Exploitation of new opportunities

Innovation results from creative ideas successfully implemented. Competitive advantage is as much about execution as it is about strategy. Managers must proactively develop weak ties and network relationships ready for when their firms need to push for new capabilities to renew their business.

4.4 Target group and value proposition:

Industry analysis reviews industry trends and competitive strategies with focus on target markets. The customer value proposition defines product and service offerings an enterprise delivers to its customers at a given price.

Figure 24: Industry analysis – Porter's five forces model

Analysis of environmental industry for dedusting and gas cleaning systems, see appendix 8.2.

4.5 Basic strategic positioning (generic strategy)

Companies hoping to create new-growth business can choose from three fundamentally different market entry strategies. The first is to develop better products than existing competitors and use them to steal away the competitor's best customer. The second is to

create a low-cost business model to launch low-end disruption targeting at price-sensitive customers. The third is to reach non consumers.

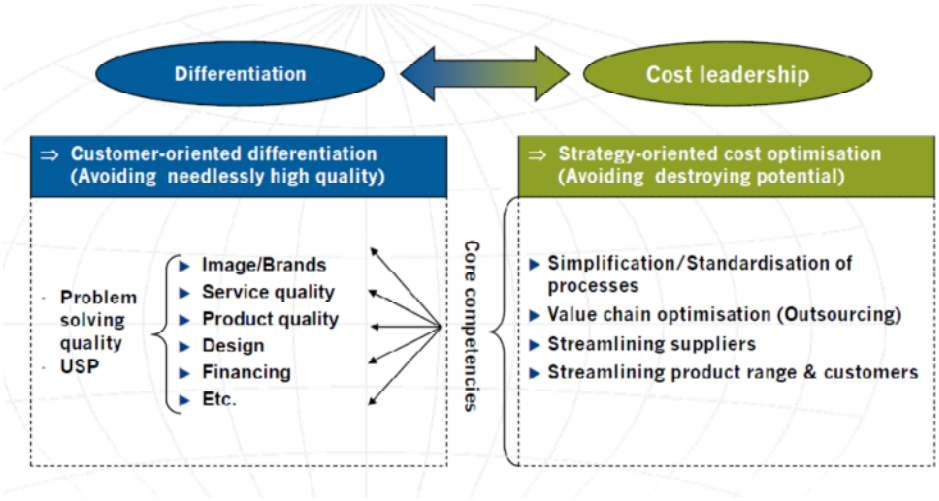


Figure 25: Hybrid positioning

4.6 Analysis of the value chain of a current or new business model

The value chain characterizes the process that a product or service moves through, from raw material to final consumption, and the value that is added at each stage to create a compelling value proposition. The value chain is a tool to disaggregate a business into strategically relevant activities. This enables identification of the source of competitive advantage by performing these activities more cheaply or better than competitors.
Owing to globalization and rapid technological change, firms are under increased pressure from rising imports from new competitors with better cost-bases. Four strategic approaches, strategic alliances, licensing to key technologies and ideas, outsourcing, and deploying an internal development process, are possible to climb the value chain and embrace knowledge-intensive, high-skilled manufacturing to compete more on quality and less on price. Partnership is a set of independent firms that work closely together to manage the flow of goods and services along the value chain by sharing on each other's skills, resources, capabilities, and knowledge. Strategic alliances can take many forms including joint ventures, consortia, licensing agreements, and buyer-supplier arrangements. Cooperation via networks can have significant impact on the ability of small manufacturers to compete in a global marketplace to deliver complex subassemblies and maintain their competitive position. In addition to networked partnerships, value creation is also possible through make-or-buy decisions. Outsourcing allows a firm to concentrate its best resources and capabilities on a few core tasks to provide unique and superior value for customers. Through outsourcing, either manufacturing or product design, in part or in full, mature firms cannot only add value to its value chain, and so move up the value chain, but can also create a fundamental shift

from one product chain to another. Sustainable growth depends on developing the capacity to learn along the whole spectrum of firm activities.
Creation of new capabilities and redesign of the value chain by using internal and external resources improve the current position and long term competitiveness.
In emerging markets, new technologies, innovation, and flexibility are critical, in contrast cost, efficiency, and incremental innovation are key in mature markets.
A firm can create greater value by increasing efficiency and effectiveness within the value chain, by introducing innovation into the production process of either products or services that generates more revenue via higher prices or larger volumes, or by undertaking a fundamental change in position in the value chain, moving to one where products or services generate more value in new and better ways than before. Make sure that the process flow is perfect and no necessary services and inputs fail. Let work be done without any interruption.

4.7 Characteristics of resource oriented strategy

Theoretical starting point: Firm heterogeneity, the company as a bundle of resources.

Success factors: Resources available, characteristics and composition of resources.

Source of competitive advantages: Superior resources available, strategic resources must be useful, scarce and unique, difficult to imitate, and difficult to substitute.

Protecting competitive advantages: Isolation mechanisms e.g. patents and property rights, causal ambiguity, time-compression diseconomies, demand for complementary resources, and pre-emption.

Practical use: Company analysis

Starting point: Analysis of strengths and weaknesses along the value chain

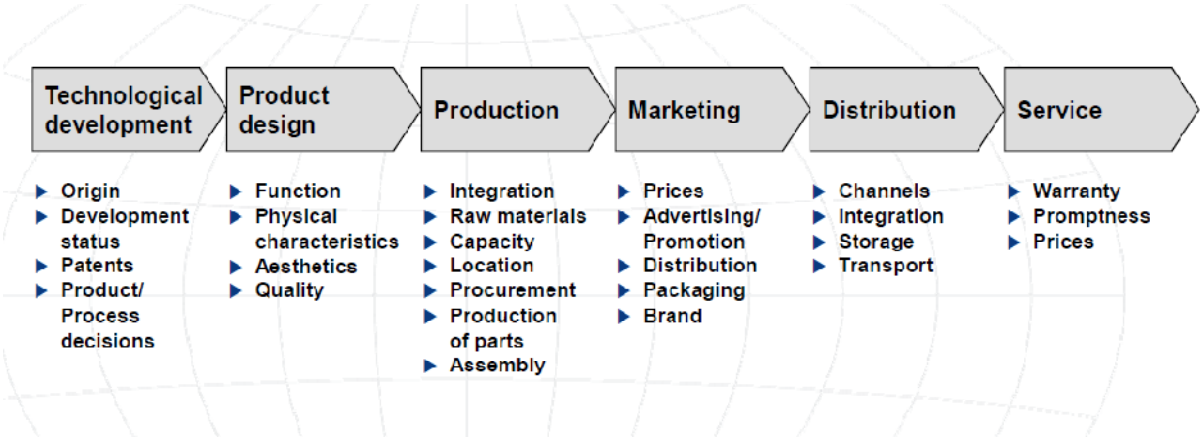


Figure 26: The value chain

Tools for company analysis: The VRIO Model

Is a resource or capability...

valuable?	rare?	difficult to imitate?	utilised by the company?	effects on competition	financial performance
no	–	–	no	Competitive disadvantage	below average
yes	no	–		Equal Competitiveness	average
yes	yes	no		Temporary competitive advantage	above average
yes	yes	yes	yes	Sustained competitive advantage	above average

Figure 27: Scheme of resource assessment

Assessment of resources and capabilities of the company Scheuch, see appendix 8.3.

Resources are the most visible of the factors that contribute to what an organization can or cannot do. Resources include people, equipment, technology, product design, cash, brands, information and relationships with suppliers, distributors, and customers. They are usually people and things, these can be hired and fired, bought and sold.
In the tug-of-war for current development resources, projects targeted at the explicit needs of current customers or at the needs of existing users that a supplier has not been able to reach will always win over proposals to develop products for markets that do not exist.
The hallmark of a great manager is the ability to identify the right person for the job, and to train his or her employees so that they have the capabilities to succeed at the jobs they are given. Frequently managers assume that if the people working on a project individually have the requisite capabilities to get the job well done, then the organization in which they work will also have the same capability to succeed. This is often not the case. To succeed consistently, good managers need to be skilled not just in choosing, training, and motivating the right people for the job, but in choosing, building and preparing the right organization for the job as well.
Processes are the patterns of interaction, coordination, communication, and decision-making through which organizations accomplish transformations to create value, products and services. Examples are hiring and training, product development, manufacturing, planning and budgeting, market research, and resource allocation.
Values of an organization are the criteria by which decisions about priorities are made. Examples are cost structure, customer demands, size of opportunity, and ethics.
Employees at every level must be able to make independent decisions about priorities that are consistent with the strategic direction and the business model of the company.

When disruptive change appears on the horizon, managers need to assemble the capabilities to confront the change before it has affected the mainstream business. Create a new organization when the existing organization is not able to exploit capabilities that reside in the current processes and values to get a new job done. Heavy weight teams are tools to create new processes, new ways of working together that constitute new capabilities. They are charged to act like general managers, and reach decisions and make trade-offs for the good of the project.

4.8 Marketing tasks and basics for bid preparation in engineering teams

Change of responsibility for marketing from division to product, from industry focus to product focus inside the structure of the firm lead to different requirements and tasks of engineering groups with clear defined functional attribution. Especially for bid preparation of made-to-measure products, but also for standardized applications basics for price generation and lay out design have to be developed and maintained by technical staff supported by the controlling department.

Pricing is very sensitive because of high volatility and pressure on the markets because of current declining demand and many vendors from countries with low labor costs and international engineering networks. Market observation and flexibility is very important in the international plant technology business. Excellent communication and the relevance of information technology tools is a main task of marketing in the future. Standardized and customized products and systems, developed by cooperation of engineers, experienced sales staff and enthusiastic customers rise international competitiveness.

4.9 Organization to enable growth

4.9.1 New entry

One of the essential acts of entrepreneurship is new entry. New entry refers to offering a new product to an established or new market, offering an established product to a new market, or creating a new organization, regardless of whether the product or the market is new to competitors or customers. On the one hand, newness represents something rare, which can help a firm to differentiate a firm from its competitors. On the other hand, newness creates a number of challenges for entrepreneurs. For example, newness can increase entrepreneur's uncertainty over the value of a new product and place a greater strain on the resources necessary for successful exploitation.

Market scope strategy

Narrow scope strategy offers a small product range to a small number of customer groups in order to satisfy a particular need. The firm focuses on producing customized products, localized business operations, and a high level of craftsmanship. Such outcomes provide the basis for differentiating the firm from larger competitors who are more oriented toward mass production and the advantages that are derived from that volume. A narrow-scope strategy of product differentiation reduces competition with the larger established firms and allows the entrepreneur to charge premium prices.

By focusing on a specific group of customers, the entrepreneur can build up specialized expertise and knowledge that provide an advantage over companies that are competing more broadly. It is the best position to offer superior product quality, given its intimate knowledge of the product attributes customers' desire most.

The high end of the market typically represents a highly profitable niche that is well suited to those firms that can produce customized products, localized business operations, and a high level of craftsmanship. A narrow scope strategy also includes the risk of attractiveness for larger established firms if the niche is very attractive and the risk of market change and decrease is substantially.

4.9.2 Managing disruptive technological change

It is important to recognize and harness 5 principles of organizational nature:

Resource dependence: Customers effectively control the patterns of resource allocation in well-run companies.

Small markets don't solve the growth needs of large companies.

The ultimate uses or applications for disruptive technologies are unknowable in advance.

Failure is an intrinsic step toward success.

Organizations have capabilities that exist independently of the capabilities of the people who work within them. Organizations' capabilities reside in their processes and their values – and the very processes and values that constitute their core capabilities within the current business model also define their disabilities when confronted with disruption.

Technology supply may not equal market demand. The attributes that make disruptive technologies unattractive in established markets often are the very ones that constitute their greatest value in emerging markets.

How did the successful managers harness these principles to their advantage?

They embedded projects to develop and commercialize disruptive technologies within an organization whose customers needed them. When managers aligned a disruptive innovation with the "right" customers, customer demand increased the probability that the innovation would get the resources it needed.

They placed projects to develop disruptive technologies in organizations small enough to get excited about small opportunities and small wins.
They planned to fail early and inexpensively in the search for the market for a disruptive technology. They found that their markets generally coalesced through an iterative process of trial, learning, and trial again.
They utilized some of the resources of the mainstream organization to address the disruption, but they were careful not to leverage its processes and values. They created different ways of working within an organization whose values and cost structure were turned to the disruptive task at hand.
When commercializing disruptive technologies, they found or developed new markets that valued the attributes of the disruptive products so that the disruptive product could compete as a sustaining technology in mainstream markets.

4.9.3 Selecting the right organization

Incumbent leaders of industry almost always emerge victoriously in sustaining-technology battles, whereas historically they have almost always lost the battles of disruption. The resources, processes, and values framework of organizational capabilities helps to see why the leading firms' track records differ so markedly across these two tasks. The industry leaders develop and introduce sustaining technologies over and over again. The organizations develop a capability for sustaining innovation that resides in their processes. Sustaining-technology investments also fit the values of the leading companies, because they promise improved profit margins from better or cost-reduced products. On the other hand, disruptive innovations occur so intermittently that no company has a practiced process for handling them. Established companies have the resources, the engineers, money, and the technology required to succeed at both sustaining and disruptive innovations. But their processes and values constitute disabilities in their efforts to succeed at disruptive innovation.
In contrast, smaller disruptive companies are actually more capable of pursuing emerging growth markets. They lack resources, but that doesn't constrain them. Their values can embrace small markets, and their cost structures can accommodate lower margins per unit sold. Executives who are building new-growth businesses therefore need to do more than assign managers who have been to the right schools of the problem. They must ensure that responsibility for making the venture successful is given to an organization whose processes will facilitate what needs to be done and whose values can prioritize those activities. The theory is that requirements of an innovation need to fit with the host organization's processes and values, or the innovation will not succeed.
The corporate CEO must strengthen and extend a company's core business while creating a

steady stream of new growth business. Mastering this dual challenge is incredibly complex. Many companies realize a gap between what they want to be and where their projections tell them they will be.

Which organizational unit (Christensen, et al., 2003) will do the best job of building a successful growth business? There are a lot of possibilities.

What does autonomous mean? There is no reason why a disruptive venture cannot be wholly owned by its parents. The key dimensions of autonomy relate to processes and values. The disruptive business needs to have the freedom to create new processes and to build a unique cost structure in order to be profitable as it makes and sells even its earliest products.

Managers whose organizations are confronting opportunities to growth must first determine to have the people and other resources required to succeed. They then need to ask two further questions. Are the processes by which work habitually gets done in the organization appropriate for this new project? And will the values of the organization give this initiative the priority it needs? Established companies can improve their odds for success in disruptive innovation if they use functionally oriented and heavyweight teams where each is appropriate, and if they commercialize sustaining innovations in mainstream organizations but put disruptive ones in autonomous organizations.

Fit innovation's requirements with the organization's capabilities.

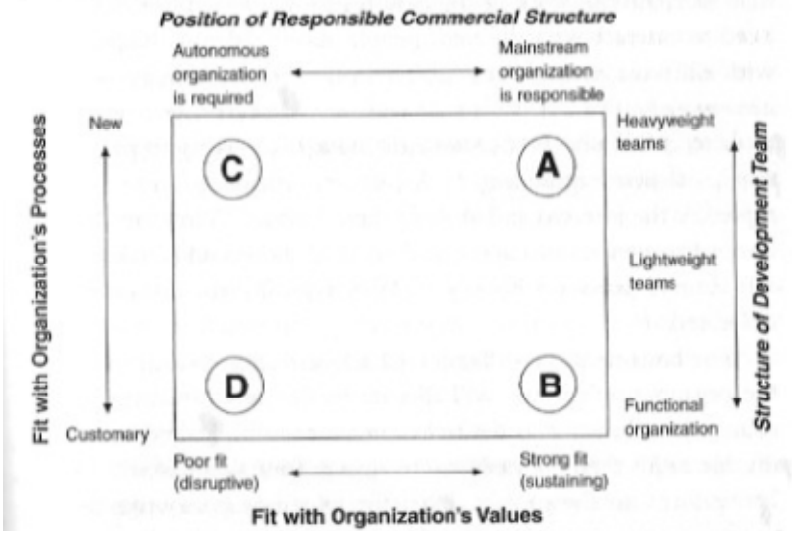


Figure 28: Selection of the right organization (Christensen, et al., 2003)

The left and bottom axes reflect the questions the manager needs to ask about the existing situation. The notes at the right side represent the appropriate response to the situation on the left axis. The notes at the top represent the appropriate response to the manager's answer to the bottom axis.

4.9.3.1 Heavy weight project teams

Heavy weight teams have the most striking advantages of ownership and commitment. They are product or process focused, need strong and independent leadership, broad skills and cross functional perspective, and a clear mission. Conflicts with functional organization and questionings about senior management influence and control are crucial. The leader manages, leads, and evaluates other team members of the core team, and is also the person to whom the core team reports throughout the project's duration. A measurable project charter sets broad performance objectives and the contract book defines the basis plan to achieve the stated goal. Firms trying to create heavyweight teams have to make changes and have to set the power and responsibility in the team's structure not to fail.

4.9.3.2 Spinning of an independent organization

It is only when a firm has neither the skills to go after an opportunity nor the motivation to develop it internally that a spinout organization makes sense. Spinning of an independent organization, because disruptive change fits neither to the organization's existing processes nor to its values, ought to be started before it is absolutely necessary.

Corporate venture investing units seek ideas, intellectual properties, or growth opportunities that do not or could not emerge within the confines of the core. They also provide investment funding to complement commercial alliance relationships. They may invest either in companies that already have a commercial relationship with the parent company or in those with potential to become a commercial partner or possible acquisition target. The motivations behind this involvement are at times solely financial.

4.9.3.3 Corporate venture unit

Companies attempting to innovate should not, and typically cannot, succeed in isolation. Even the most innovative idea will not become a great business if it does not have the support of suppliers and the collaboration of channel, alliance, or technology licensing partners.

Corporate venture unit can enhance an organization's overall innovation efforts. Corporate venture support of businesses that drive, or benefit from, the activities of the core enterprise can boost demand for the core's offering, or enable participation in more lucrative links of the value chain that would otherwise be out of scope for the core.

In the early years of a new business, orders are likely to be denominated in hundreds, not tens of thousands. If we are lucky enough to get a few wins, they almost surely will be small ones. In a small, independent organization, these small wins will generate energy and enthusiasm. In the mainstream, they would generate skepticism about whether we should even be in the business. By definition then, the new organization set up by the incumbent

would be classified as an entrant in this market context. An incumbent can disrupt itself. It also can create new business ventures that disrupt others. Spinning out a new venture creates an unencumbered external organization to join the fray. If the incumbent manages these challenges and provides the spinout organization with enough latitude, it can create powerful advantages. The incumbent can even support the spinout with resources and processes that would facilitate its disruptive path.

Innovation proposals that get the funding and manpower they require may succeed, those given lower priority, whether formally or de facto, will starve for lack of resources and have little chance of success. One major reason for the difficulty of managing innovation is the complexity of managing the resource allocation process. A company's executives may seem to make resource allocation decisions, but the implementation of those decisions in the hands of a staff whose wisdom and intuition have been forged in the company's mainstream value network. Disruptive innovations entail significant first-mover advantages, therefore leadership is important. Disruptive technologies should be framed as a marketing challenge, not a technological one. Give responsibility for disruptive innovations to organizations whose customers need them so that resources will flow to them. Set up an organization small enough to get excited by small gains. Plan for failures and think of your initial efforts at commercialization as learning opportunities.

4.9.3.4 Ambidextrous organization

Organizational discontinuities are driven either by performance crisis or by technology, competitive or regulatory shifts. Whereas less successful firms react to environmental jolts, the more successful ones proactively initiate innovations that reshape their market.
Ambidextrous organizations (Tushman, et al., 2002) leading evolutionary and revolutionary changes and match simultaneously the presence of different activities. Some divisions may be small and organic, e.g. R+D, a new product line, and other divisions may be larger and more mechanistic, e.g. engineering, manufacturing, mature product line. Spin off innovation function to organic lead parts to have less interference with the mechanistic organization, to allow less formalized procedures for internal communication, as well as to leverage competence and excellence to these more or less autonomous units.
Ambidextrous organization establish project teams or small start up business units that are independent units, each having its own processes, structures, and cultures, but are integrated into the existing management hierarchy. Three precursors to innovation are a core business that is in control, a game plan for growth, and mastery of the resource allocation process.
Autonomous growth groups to spearhead innovation involve a higher level of business-building capability than that of incubators. Growth groups typically have a secure budget and

decision-making autonomy. The role of growth groups generally involves proactive identification and development of noncore business concepts. They maintain a small staff of entrepreneurial generalists and tap the talent pool of the core on an ad hoc basis through rotational programs. Some groups tap into partially allocated functional experts from the main organization, while others consciously avoid touching the core in any way. Established firms tend to be good at improving what they have long been good at doing, and entrant firms and autonomous groups seem better suited for exploiting radically new technologies. The organization's structure and the way its groups learn to work together affect the way it can and cannot design new products.

4.9.4 Growth through evolution

Organizations are subject to environmental pressures and evolve through periods of incremental adaption punctuated by discontinuities. Over time, the fittest survive by developing an effective system for the ability to handle complex integrated processes and designing the system for stability with focus on technical skills to perform complex tasks.

4.9.5 Growth through revolution

Although organizational growth by itself can lead to a periodic need for discontinuous change. This is a pervasive phenomenon that occurs across industries, the dynamic of technology cycles and innovation streams. Successful firms proactively initiate innovations that reshape their market (O'Connor, et al., 2006). Managers must continually readjust their strategies and realign their organizations to reflect and proactively shape the underlying dynamics of technological change in their markets.

4.9.6 The challenge of culture and sustained growth

The challenge for managers is to actively shape organizational cultures to both execute today's strategies and create streams of innovation (O'Reilly III, et al., 2004) that shape tomorrow's competitive advantage. Culture can both provide competitive advantage and stifle innovation and change. In the face of significant changes in technology, regulation, or competition, organizational transformations involve simultaneous shifts in the firm's structure, systems as well as in its culture, processes, and competencies. Ambidextrous organizations leading evolutionary and revolutionary change.

The contradictions inherent in the multiple types of innovation create conflict and dissent between the organizational units, between those historically profitable, large, efficient, older, cash-generating units and the young, entrepreneurial, risky, cash-absorbing units. Without integration, however, the potential of ambidextrous organization is lost. The challenge is to create co-existing highly differentiated and highly integrated organizations, keeping a multitude of activities going at once requires greater skills. The need for creativity must be

balanced with the need for execution. The senior team's role is to embrace these contradictions and take advantage of the tensions and synergies that come from juggling multiple competencies simultaneously. Organizations can renew themselves through proactive strategic reorientation coupled to bets on dominant designs, architectural innovation or product substitution.

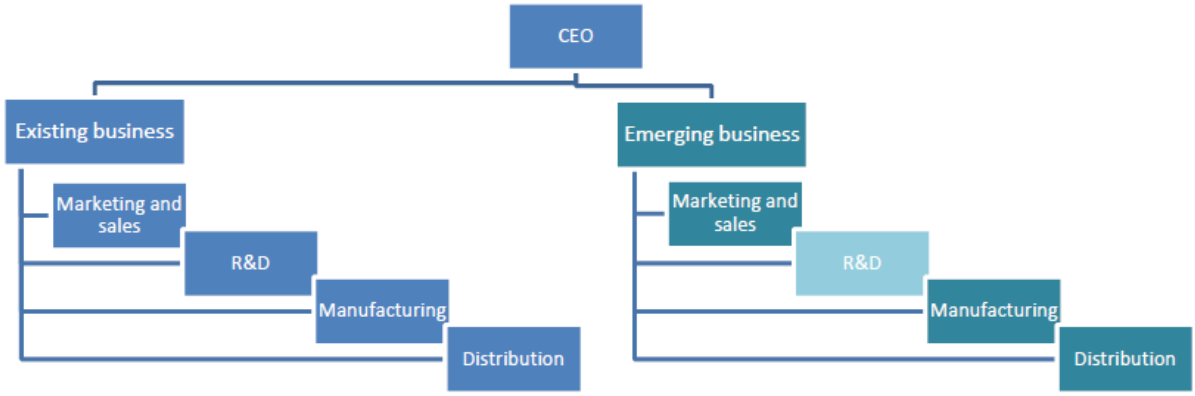


Figure 29: Ambidextrous organization

Ambidextrous leadership, different alignments held together through senior-team integration, common vision and values, and common senior-team rewards.
A clear and compelling vision, relentlessly communicated by a company's senior team, is crucial in building ambidextrous designs.

Alignment	**Exploitative Business** focused on exploiting existing capabilities	**Exploratory Business** focused on exploring new opportunities
Strategic intent	cost, profit	innovation, growth
Critical tasks	operations, efficiency, incremental innovation	adaptability, new products, breakthrough innovation
Competencies	operational	entrepreneurial
Structure	formal, mechanistic	adaptive, loose
Controls, rewards	margins, productivity	milestones, growth
Culture	efficiency, low risk, quality, customers	risk taking, speed, flexibility, experimentation
Leadership role	authoritative, top down	visionary, involved

Table 6: Alignment of ambidextrous organization

Jack Welch replaced the staff-led, document driven process with more personal, less formal, but very intensive face-to-face discussions. A key role of corporate management was facilitating coordination across GE's business units. Boundaryless behavior is the soul of

today’s GE. Ambidextrous individuals are cooperative and seek out opportunities to combine their efforts with others.

4.10 Profit generating mechanism

Revenue management with flexible pricing and quantity allows to match efficiently demand with supply. Pricing decisions include the determination of selling prices for certain price intervals as well as the allocation of selling prices to different customer segments. Quantity decisions provide answers on how capacity is split up to customer segments or products, and if a bid price should be accepted at a certain point of time. The firm emphasizes higher and lower volumes in terms of market opportunity and internal capacity.

5 Proposal to Improve Exploitation

SWOT Analysis of exploitation capabilities and existing structures and processes at Scheuch shows the potential for improvement and growth.

SWOT Analysis		intern	
		Strengths	Weaknesses
extern	Opportuni-ties	Diversification – product, brand evolution Single source Value chain – from technological development, engineering, and design to service – high vertical integration degree with high potential for improvements Configuration and customization of solutions, products, and services - choice navigation - postponement in the value chain – prefabrication and customer order related fabrication Solution space – standardized plant engineering and construction Stable processes Promotion Customer relationship - reliability of staff – long time personal relationship	Rigid structure of sales divisions with no room for new opportunities – launching a 6th division for start ups Improving of collaboration of engineering, marketing and sales Lack of product management and product marketing Launching of innovation – training of engineering and sales personnel Leveraging existing technologies into new industries and markets Customer relationship – after sales service without marketing competence Product management – competitive awareness and pricing Quality of processes and information and communication technologies – plenty of space for improvement
	Threats	Competitors from low cost countries - value chain to keep cost leadership Competitors, fast seconds – innovativeness of the firm Place – engineering and manufacturing – high costs – well educated employees and engineers, high automation degree Appropriability regime – patenting of own ideas and solution approaches Political effects – adequate product portfolio Market demand – disruptive technologies	Radical innovations – structure and culture to nurture innovativeness Competitors occupy new business– as a consequence of fixed market segmentation and internal processes at Scheuch we act less flexibly Mature products in a market with high rivalry Internationalization – lack of knowledge and hands-on experience - implementation of strategy Collaborators – imitators Fluctuation of engineering staff

Table 7: SWOT Analysis of exploitation capabilities at Scheuch

5.1 Core business and opportunities for growth

Core business consists of plant engineering and construction structured in five existing divisions. Most activities of the firm are focused on current business.

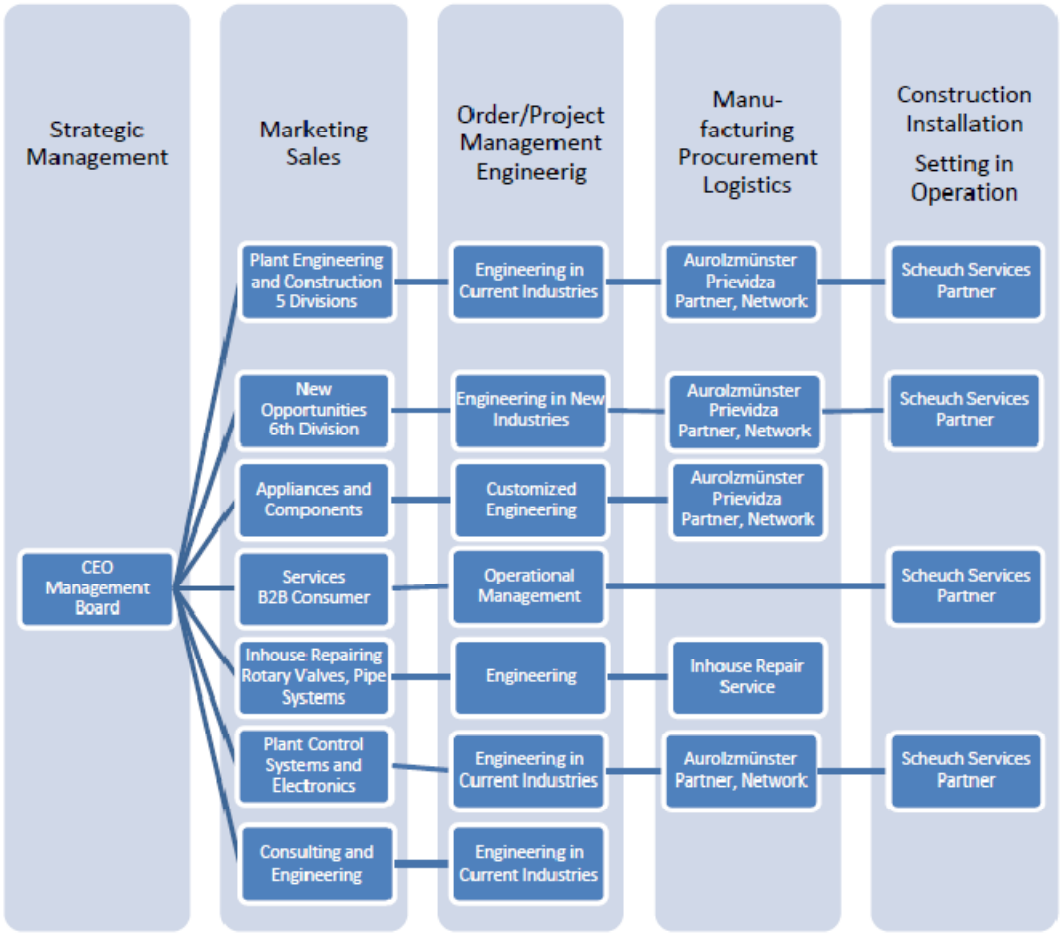


Figure 30: Structure for core business and opportunities for growth at Scheuch

Founding the 6th division for new opportunities to nurture new appliances in new industries would offer a huge potential for growth. New industries do have different demands. A specialized knowledge about customer's process is required. The marketing and sales organization for these new business fields should act like a small start up, it should differ and be independent from the core business organization.

Appliances and components need a quite different business model, parts of the value chain are different from the value chain of the core business and also organization of engineering has to be adopted. An autonomous team to act flexibly and to follow its own strategy needs to be formed.

The service business model is incomplete as marketing and sales especially for bid preparation and promotion does not exist and so a considerable market share is not

accessible yet. It is required to set up a business unit to fulfill the missing activities and to make it responsible for its competitiveness and revenue generation. Within this unit three main tasks are to be attended. These are plant construction and supervision, plant commissioning (setting in operation) and after sales service. Intensive cooperation with partners is to be continued but crucial core competencies have to be developed inside the firm to accomplish possible growth in this huge business field. Internationalization is a main challenge for this current and future business.

In-house reparation of Scheuch appliances underlying abrasive wear is a service that Scheuch does not offer in an effective way to its customers. The whole process from bidding to order achievement and order execution is to be structure and reorganized.

Consulting business could be an opportunity to separate the consulting and engineering only business from the core business of plant engineering and construction and to position this new venture as an independent center of special competences.

Plant control systems and electronics are very important in the firm's core business to transfer concepts into well functioning plants. These competences are required for customer advisory service as well as for order management to adjust customer needs with the firms offered technology. Working close together with international partners will be a challenge for the future global business activities.

5.2 Performance gaps and space for improvement at Scheuch

5.2.1 Organization

Different technologies and different markets have differing needs, so Scheuch should have distinct organizational structures and management practices for different circumstances. Create room for new opportunities! Overcome resistance, restrictions and boundaries!

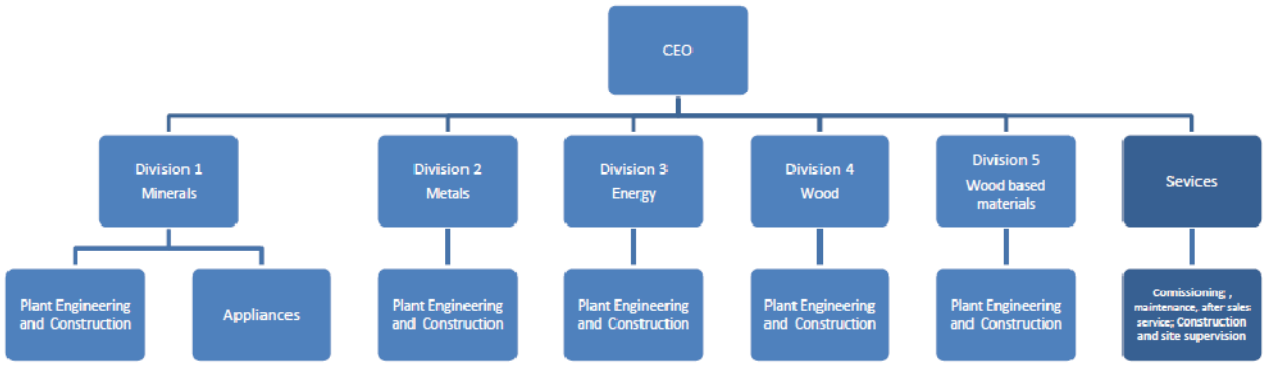


Figure 31: Current organization for exploitation at Scheuch

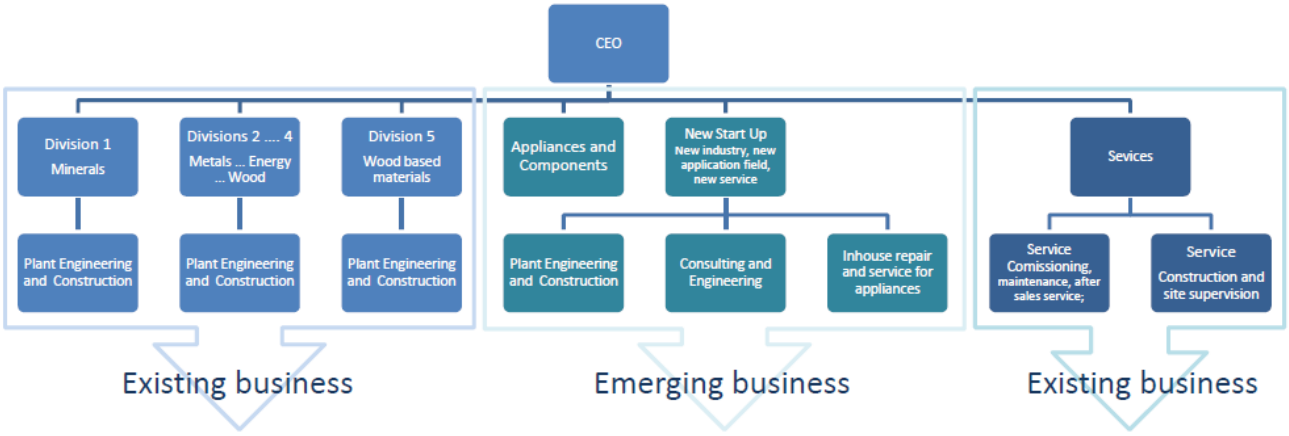


Figure 32: Ambidextrous new organization for growth and exploitation at Scheuch

My proposal is the foundation of new entities with responsibilities and rights to form and create new strategies, structures, and business models to bring new opportunities to revenues, margins, and valuable performances. Start small with low risk and give these units incentives to let them grow and be successful. Let them act as entrepreneurs.

5.2.2 Resource allocation

The budget for discontinuous innovation (new products and processes) and for incremental innovation (improvement of products and processes) is toughl negotiated in aggregate every year as well as the allocation to existing and emerging business. Innovation proposals that get the funding and manpower they require may succeed.

Core business can be controlled by planning the growth rate and the required financial and human resources for a period of five years. Cost cutting is the wrong way. Keep the core business going, innovate processes to increase efficiency, innovate products and services to meet customer needs.

Exploit new markets with existing products, harness economies of scale, and generate revenue.

Scheuch successfully tackles new opportunities when having the resources to succeed, when the processes facilitate what needs to be done, and when the values allow to give adequate priority to that particular opportunity in the face of all other demands that compete for the company's resources.

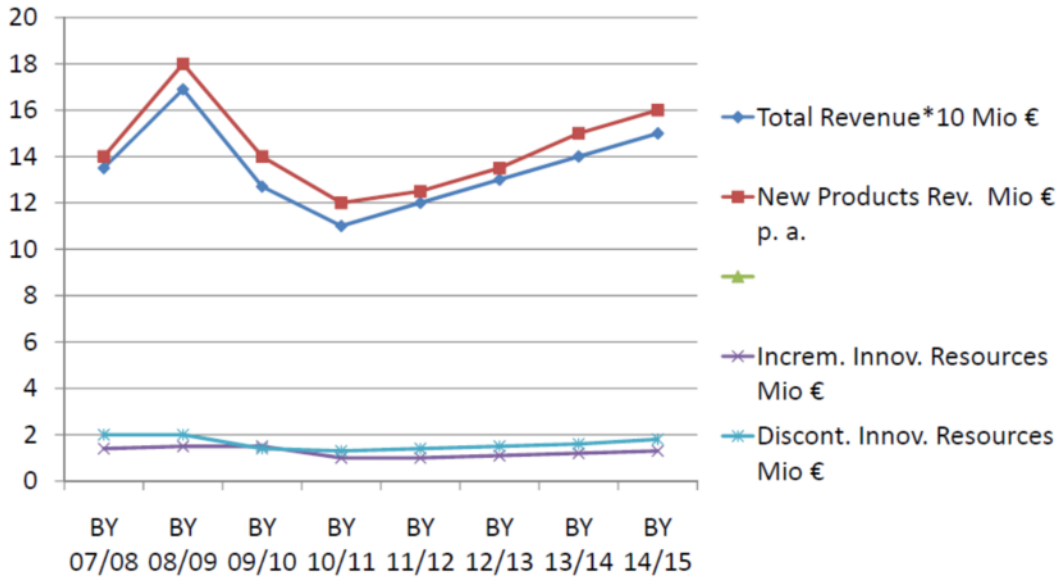


Figure 33: Total revenue, new product revenue, incremental innovation budget, and discontinuous innovation budget at Scheuch

Scarce resource allocation for discontinuous and incremental innovation will influence the quality of engineering in the long term.

Declining revenues and not declining effort for maintaining Scheuch's product portfolio means a relative increase of costs for maintaining the product portfolio.

The relationship of exploration to exploitation –relative exploration - is about 1.0 at Scheuch – medium industry R&D - so referring to a research about S&P 500 corporations (Uotila, 2009) let me come to the assumption that the effort for maintaining the existing product portfolio is too little and has a negative implication on product and process quality.

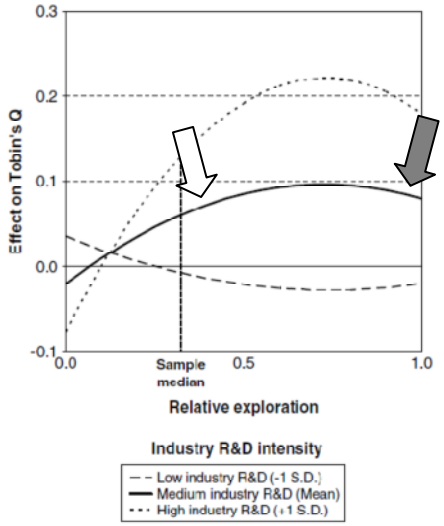


Figure 34: Relationship between relative exploration, industry R&D intensity, and firm performance at Scheuch (Uotila, 2009)

Facing a medium industry R&D, effect on Tobin's Q is a measurement of market value of assets as a dependant performance variable, between 0.5 and 1.0 of relative exploration, there is no significant increase of performance. Internal optimization of processes and costs needs resources to plan and accomplish these measures in a balanced way. Sustaining and disruptive innovations should not be overemphasized or underemphasized .

5.2.3 Culture

Appreciation of accomplished assignments and stimulation for new challenges are important factors for the culture of a company. We have to be willing to cannibalize what we are doing today to ensure our leadership in the future. Too much of the former culture, and organizations may fail to capture the value of their early innovations. Too much of the latter, and firms may develop toxic levels of inertia and resistance.

Personal responsibility, development of skills and capabilities, and an appropriate reward system for the employees to be motivated and open for new ideas, opportunities and challenges are pivotal criteria for success.

Permanent learning and training programs effect work behavior in two ways. The most obvious is by directly improving the skills necessary for the employee to successfully complete the job. A second benefit of training is that it increases an employee's self-efficacy and therefore affects her or his behavior to perform better in new situations (Robbins, et al., 2007).

5.2.4 Strategic alignment and marketing of construction, commissioning and after sales service

The management needs to be clear about the strategy, objectives, and vision of the unit. Such clarity is the bedrock of managing innovation and change. Management attention should focus on clarity in problem definition and differentiation between short term activities and critical long term problems and opportunities. A lack of strategy for the appliances and components business entrails no clear goals and fails to show how to conduct new emerging tasks thus hindering the growth of revenue.

Life-cycle services (Kujala, 2009) for maintaining, upgrading and revitalizing project products have increasing importance in the business of firms for engineering and construction. Life-cycle services include a system's construction and commissioning, maintenance and repair , spare parts provision, optimization, upgrading, and finally decommissioning of a system. Simple maintenance contracts can increase spare parts business, availability-based contracts share some operational risk between the business parties and require more cooperation. A close cooperation between the supplier and customer can help to realize coinnovations and technological developments and can provide competitive advantage for

both of the business parties. Network and partners of engineering and construction business are different to network and partners of life-cycle services. Performance based contracts will be the next development stage.

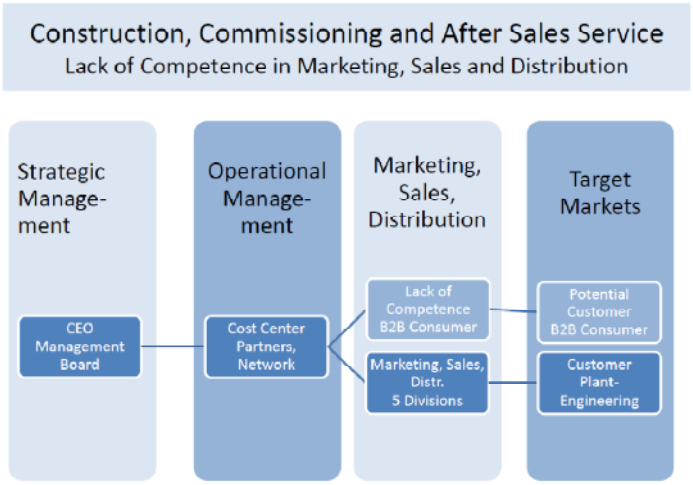


Figure 35: Structure of services at Scheuch

Set the appropriate strategy and organization, write a business plan and give employees the power and motivation to run the business successfully. This business model will be disruptive but it does matter.

5.2.5 Strategic and operational management of appliances and components business

Lack of engineering and design competences hinder the flow of information to support marketing and sales activities and interrupt the process of offering standardized and customized solutions to customers. Substitution of experienced employees by new ones with less experience and knowledge about course of actions causes a lot of troubles and sunk costs. Long term employment with well educated and skilled people must be quested.

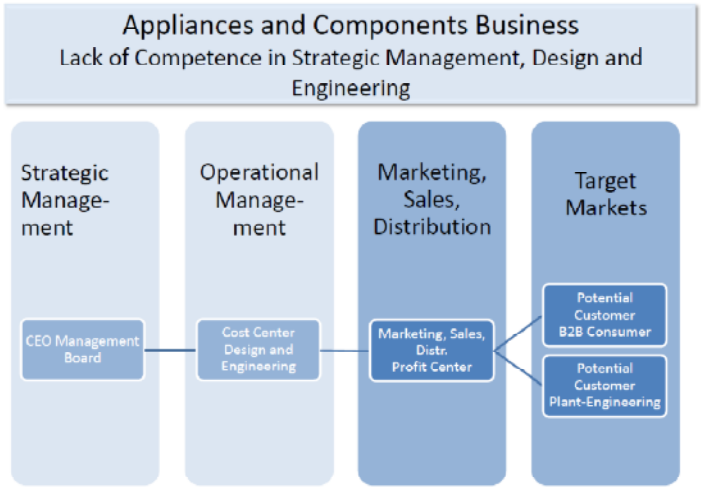


Figure 36: Structure of appliances and components business at Scheuch

Setting a clear strategy, forming the adequate organization for the business unit, creating a new business model, and creating a business plan are important arrangements to make sure that this potential opportunity will be exploited effectively.
Based on economies of scale and scope and learning curve capable measures have to be set.

5.2.6 Marketing of internal engineering services

Close the marketing gap by developing marketing skills of product managers adjusted to the need of Scheuch. Marketing of internal services as engineering of steelworks and plant design, product engineering, electrical engineering, construction and installation, and after sales service is required for the core business and new opportunities.
The existing business model for core business is incomplete. Not only engineering skills are important for successful plant engineering, especially marketing to transfer the knowledge from technical division to sales division to give best available support to internal customers – sales staff, and to customers directly.
Price finding, technical specifications, and proposals are supported by self developed software to act very quickly and flexibly in the market and to support the customers in their purchasing process and to support the use and maintenance of products and plants best.
Each engineering department needs to have “internal marketing and sales” to serve premium support to the sales department of all divisions and to other business units along the value chain! Product benchmarks, product positioning, and arguments for the best unique selling proposition are crucial tasks for engineering departments to serve the firm’s generic marketing.

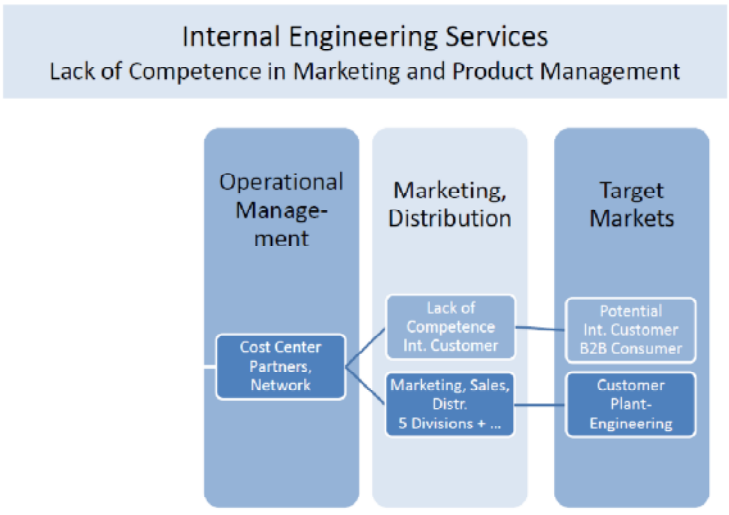


Figure 37: Structure of engineering services at Scheuch

5.3 Growth opportunities

It is essential to foster core business to generate planned growth rate over the next five years. Create new business units for selling appliances and components, for new start ups in new industries, new application fields, and new services. Both economies of scale and economies of scope ensure the growth of the core business and the new business. Take care which kind of business model, the current or a new one, supports the new business most.

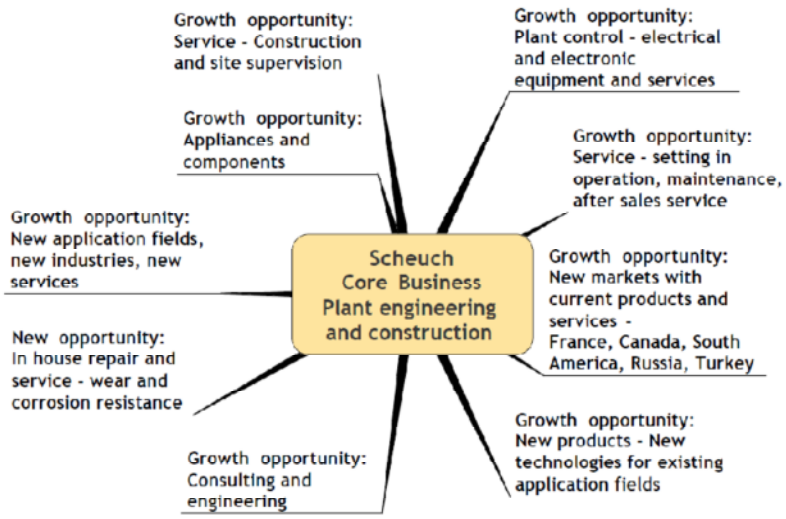


Figure 38: Growth opportunities at Scheuch

Write and appraise a business plan for each of the new business units. Keep it simple and clear and create an organization separated from the core business with entrepreneurial spirit and creativity to start the new business units.

Growth strategy can reduce fixed and variable cost per unit produced and offered in the market place. So it is an adequate means to increase the attractiveness of products by decrease of prices.

The effects of economies of scale, economies of scope, and the learning curve cause a decrease of the costs per unit and a rise of competitiveness.

Referring to the economies of scale the increase in efficiency of production rises as the number of goods being produced increases. Typically, a company that achieves economies of scale lowers the average cost per unit through increased production since fixed costs are shared over an increased number of goods. Concerning the company Scheuch it is very important that manufacturing capacity utilization will be high and that the cost of R&D, new

product development, and engineering will remain on the same level even if the revenue increases.

In regard to economies of scope the average total cost of production decreases as a result of increasing the number of different goods produced by sharing engineering competencies, manufacturing facilities, logistics, sales organization, etc.. Leveraging core competencies, diversification into related products, and saving on inventories are sources of economies of scope.

Learning or the experience curve is essential in introducing new products, new technologies, and new cooperation with partners. The rule used for representing the learning curve effect states that the more times a task has been performed, the less time will be required on each subsequent iteration. Learning leads to lower costs, higher quality and more effective pricing. Size reduces the average cost of innovations. Higher volume increases production efficiency, makes the firm more attractive to suppliers, and therefore increases its bargaining power. Industry analysis shows tight competition but also opportunities for growth. Appropriate positioning of products and services, e.g. low energy consumption, attractive life cycle costs, high quality standard of customer advice, collaboration and information flow are precursors to increase market share. Permanent improvement and adaption of the value chain, vertical integration and international partnering for core competencies like manufacturing, engineering, and construction offers long term cost advantage and competitiveness.

6 Summary and Forecast

This Master Thesis gives an overview over theories and innovation patterns to give a deep understanding how markets, companies and technologies interact.
Exploration needs clear rules and guidelines. Innovation must happen outside routine business operations. Flat organization with loose hierarchical control can nurture innovative culture and foster creativity. Encourage employees to look permanently for new ways to improve the current way of doing business. Flexible strategic planning has to ensure right resource allocation to get innovation done.

6.1 Fit of innovation and organization

Closing the gap between theory and practical accomplishment offers a huge potential to increase efficiency and effectiveness of new product development. Beyond measurable values of technological, economic and miscellaneous benefit of a new product project like the increase of sales and profits, lower costs or environmental effects there are always a lot of additional indirect effects like know-how transfer, advertising, security, skills, and social effects.
Efficient resource allocation based on established processes and engineering procedures, information technology tools, and excellent communication between participants ensure stable core business. Flexibility can be handled by external work force. The challenge to exploit new opportunities is to found the appropriate business model and the appropriate organization.

6.2 Balancing exploration and exploitation

Scheuch also has a tendency to exploit current knowledge which is familiar and within easy reach from the existing geographic and technological position. Exploitation is important for short term success, extending and defending core business and increasing profitability. Assets and processes constrain innovation as Scheuch is a medium-sized, technology-based enterprise with high vertical integration of manufacturing and engineering capabilities. In the environment of the company Scheuch innovation is the important basis for competition. The role of corporate research is to generate new technologies, some of which can be used effectively in the various parts of our organization responsible for new product development for existing businesses. Overcoming the constraints of local search we should engage in distant searches, distant from our current knowledge base to build emerging businesses and to create viable options for the future. Balance the challenges associated

with exploiting existing opportunities as well as exploring new ones simultaneously. Significant product improvement and radical innovation is more exploration, incremental product and process innovation is exploitation.

In this Master Thesis I listed proposals to improve the exploration as well as the exploitation of the current and future business of the Scheuch company.
To remain successful over long periods, organizations must be ambidextrous – able to implement both incremental and revolutionary change.

“Big companies must learn to be close to ruthless in cannibalizing their current products and processes just when they are most lucrative and begin the search again, over and over (Foster, 1986).”

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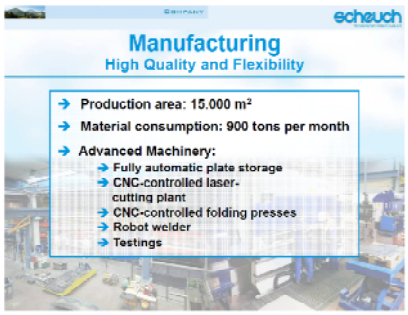
8 Appendix A

8.1 The Scheuch company

In the fields of ventilation, gas cleaning systems and environmental protection, and energy recovering solutions we aspire to translate new demands into innovative technology and to develop this technology until ready for market – and to do so as the very first. Excellent understanding of the production processes and production demands, know-how that spans a variety of industries, years of experience and a comprehensive service program enable us in each case to configure the optimal plant concept for our international industrial clients.

Scheuch offers a complete line-up of efficient extraction, dedusting and pneumatic transport equipment, along with economical cleaning systems for exhaust gases and flue gases. We keep the state of technology in this sector on the move with innovative, patented technologies.

Scheuch - Technology for Clean Air



8.2 Aggregate analysis of environmental industry for dedusting and gas cleaning systems by Porter's five forces model

	Supplier's negotiation power is **low**	
	Development of suppliers from partial to full service for product and service offerings Excess capacities for engineering and manufacturing Suppliers from low cost countries stress pricing and global competition Low product differentiation	
Threat posed by **new entrants** is **high**	**Rivalry** within the industry sector is **high**	Threat posed by **substitute products** is **medium**
Absolute cost advantage - by new entrants from low cost countries Product differentiation – new technology, new product or service features Political and legal barriers Counterstrikes by established producer – e.g. aggressive pricing	Excess capacity and exit barriers Cost factor manufacturing and engineering Diversity of competitors Declining market volume Global shifting markets	Buyer's willingness to buy substitute products Relative value for money of substitute products Offshore engineering and manufacturing Long lasting life time circles of existing technologies and products
	Buyer's negotiation power is **high**	
	Competition between suppliers High price sensitivity Size and concentration of the buyers in relation to the producers	

Table 8: Aggregate analysis of environmental industry for dedusting and gas cleaning systems

8.3 Analysis of Scheuch company by VRIO model

Is a resource or capability …

Resource or capability	Valuable	Rare	Difficult to imitate	Utilized by the firm	Effects on competition	Financial performance
Sales staff – technological knowledge	yes	yes	yes	yes	Sustained competitive advantage	above average
Customer long term relationship	yes	no	no	yes	Equal competitiveness	average
Brand	yes	-	-	yes	Sustained competitive advantage	average
Engineering capability	yes	yes	yes	-	Temporary competitive advantage	average
Manufacturing capability and assets	yes	yes	yes	yes	Sustained competitive advantage	above average
R&D basic technologies	yes	yes	yes	yes	Sustained competitive advantage	above average
Product portfolio	yes	no	no	yes	Sustained competitive advantage	above average
Service – construction and commissioning operational competence	yes	no	no	yes	Equal competitiveness	below average
Marketing and sales of engineering and services	yes	yes	yes	no	Competitive disadvantage	below average

Table 9: Resource or capability assessment by VRIO Model at Scheuch