

CHALLENGES IN CUSTOMIZING THE AUSTRIAN GREENHOUSE GAS INVENTORY

DEVELOPING DRAFT SPECIFICATIONS FOR A CONFIGURATOR
BASED ON CUSTOMERS' NEEDS

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

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AFFIDAVIT

I, Manfred Ritter, hereby declare:

1. that I am the sole author of the present Master's Thesis, "Challenges in Customizing the Austrian Greenhouse Gas Inventory, 89 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
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.

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Signature

PREFACE

This thesis is an attempt to merge the science of business administration with my own work experience in the area of climate change. The thesis uses the example of the Austrian Greenhouse Gas Inventory to analyze the challenges and opportunities in identifying new market opportunities faced within the non-profit field of environmental protection.

The purpose is to show ways of how to integrate methods and tools developed to maximize profit into the toolbox of a value-driven public management. The underlying assumption is that the science of business administration is mainly about identifying options and that this is independent of whether it is done before the background of profit or before a more general public interest.

The idea to this thesis is inspired by the fact that the public service of environmental control was outsourced a few years ago. It was outsourced by the government with a broad non-profit goal but with only limited funding possibilities. Resolving the conflict of goal and funding has to be addressed in long-term planning as well as in day-to-day business. This thesis tries to show ways of dealing with the potential conflict of funding-needs and environmental protection.

The thesis is written with the sole intent to identify challenges and show indications of how to proceed further for the specific situation of the Austrian Greenhouse Gas Inventory. But I hope that others faced with similar non-profit challenges will find this overview useful too.

I'd like to thank my supervisor Marc Gruber and my senior officer Jürgen Schneider for their comments and support. But this work couldn't have been done without the support of my wife Ingrid. My love goes out to her and my two children that remind me daily that the non-profit world is one worth living for.

ABSTRACT

This master thesis applies strategy and marketing approaches to the Austrian Greenhouse Gas Inventory. The focus is on methods and tools that utilize market opportunities through an understanding of customer behavior and needs.

The thesis identifies challenges that are relevant for customizing a non-profit process that so far has been optimized in serving only the state as its sole customer.

Main results are specific recommendations on how the aim of customization can be defined in non-monetary terms, how and when customers should be involved, and on how an initial set of specifications for a Configurator would look like. It moreover addresses the question of “what business the inventory is in?” and defines market segments and a potential target market for the Austrian Greenhouse Gas Inventory.

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1. INTRODUCTION

THE CUSTOMIZATION CHALLENGE FOR THE AUSTRIAN GREENHOUSE GAS INVENTORY

1.1. PROBLEM FORMULATION

Umweltbundesamt's Challenge

Umweltbundesamt became a company with limited liability through an amendment in the Environmental Control Act in 1999. This act gives Umweltbundesamt the flexibility to define its own business strategy while reserving a fixed amount of state budget to fulfill specific tasks of environmental control for the Austrian government (see annex 1 for more on the specific legal context of Umweltbundesamt).

The outsourcing process was followed by a number of organizational changes to adapt to the new situation. There have been two major organizational restructuring in 2000 and 2007 which set-up HR, Controlling, and Communication departments and four programmes that have line responsibility for about 25 departments dealing with specific environmental control (including laboratories and IT support).

The organizational restructuring has been supplemented by new rules for the allocation process of state-budget and the start of a process called "Öffnungsprozess" which aims at setting-up a more formalized New Product Development process and intensified customer-orientation at Umweltbundesamt in order to secure additional funds through new markets and customers.

Most recently, top management at Umweltbundesamt presented a budget outlook for the period up to 2015. It is based on the assumption that state-level budget restrictions will lead to reduced funding from the Ministry of Environment and other state agencies in the coming years. The outlook shows that Umweltbundesamt will need additional sources of income to sustain the current level of environmental control and the current number of employees.

Since its outsourcing in 1999, it has been Umweltbundesamt's challenge to define a business strategy that opens new markets and at the same time builds on and supports the task of environmental control for the government. It is Umweltbundesamt's strategy to meet this challenge through an innovation-driven transformation of existing capabilities of environmental control via customer-orientation.

The Role of the Austrian Greenhouse Gas Inventory

Umweltbundesamt prepares the Austrian National Greenhouse Gas Inventory through a number of specific projects which are led by the Department of Emissions & Climate Change. It is one of the core tasks of environmental control specified in the Environmental Control Act as a specific support to the Austrian Government in §6

paragraph 2 (see annex 1). The main portion of funding comes through the internal allocation process of state budget.

The international focus on climate change and greenhouse gas emissions, and international legal frameworks, have enhanced the importance of the GHG inventory over recent years. Consequently, the inventory itself has had a budget increase that mirrors this development. Driven by international agreements the Ministry of Environment has been willing to supply additional funding in recent years to cover additional requirements. However recently pressure has increased to find other sources of income to sustain or improve the current quality of the Austrian National Greenhouse Gas Inventory (see annex 2 for more on the inventory itself).

While the GHG inventory contains a wide range of information and has been widely used by different organizations, the Ministry of Environment up to now remains the main national customer. So far, most innovations and customer-orientation of the inventory has been geared towards the Ministry of Environment.

The Problem to Overcome

Under the assumption of reduced state funding, it will be crucial for Umweltbundesamt to attract new customers and additional funding in the coming years in order to maintain and improve the current level of environmental control for the state.

The Environmental Control Act restricts the possibilities of Umweltbundesamt to attract new customers to offers that are in the public interest and represent an added value to the current level of environmental control. This is one of the reasons why it has proven difficult to attract customers outside the Ministry of Environment.

Within these restrictions, the problem for Umweltbundesamt is to overcome an information deficit on potential customers' needs and identifying those needs that have the highest synergies with environmental control. And from there, to identify those features within environmental control, for which customers are willing to pay most for additional customized services.

1.2. OBJECTIVE OF THE MASTER THESIS

Select and Apply Tools to Identify Market Opportunities through Customization

This thesis presents methods and tools appropriate to understand customer needs related to the Austrian Greenhouse Gas Inventory. It will identify and assess customization challenges peculiar to the specific organizational and legal context of Umweltbundesamt. The thesis will apply selected methods and tools in the empirical part of the study and evaluate customer needs based on these results.

Assess the Current Customization Process and Production Design

This thesis assesses the current customization process and the existing process design of inventory preparation. It will identify product attributes along which customer needs, diverge and look at other existing organizational or value chain resources that could supplement the existing process design. It will also look at possibilities to translate customer needs and the existing design into a product architecture that would be a suitable basis for a service configurator of the Greenhouse Gas Inventory.

Develop Draft Specifications for a Configurator

Both, the assessment of customer needs and the proposals for an improved process design, aim at offering customized services for the Austrian Greenhouse Gas Inventory. The thesis will follow-up on this by developing draft specifications for a configurator that would give customers an electronic way to receive customized services based on their specific needs while at the same time keeping additional production time at a minimum.

Note: This thesis is part of a project within Umweltbundesamt that develops a business model for (mass) customized services based on the Austrian Greenhouse Gas Inventory. This project will take over recommendations on the process and draft specifications developed within this thesis.

1.3. COURSE OF INVESTIGATION

Framework

This work is part of an overall effort of aligning the business of inventory preparation with its customer's needs without losing the benefits of the well established current production design. It can thus be linked to the process of 'mass customization', where a firm develops a set of organizational capabilities that allows them to deliver services with enough variety to provide customers with a specific service – at mass production costs.

The overall framework for the investigation is taken from mass customization as a way of seeing it as a process for aligning a business with its customers' needs and the process of tailoring this approach to a specific business. Mass customization in this sense is understood as the development of three fundamental functions: (1) the ability to identify the product attributes along which customer needs diverge; (2) the ability to reuse/recombine existing resources; and (3) the ability to help customers identify or build solutions to their own needs (Salvador, Martin, de Holan, & Piller, 2009).

Investigation Sequence

This thesis will start-out by reviewing strategic and marketing methods/tools available to utilize market opportunities and to customize production processes. It will do this by

summarizing key findings in the literature and link these to the existing production design and the current customization process. The guiding research question for this section on literature and methods will be: “What tools are available to identify market opportunities and how can the principle of (mass) customization help to overcome an information deficit on potential customers’ needs?”

This general overview on marketing methods and tools available for understanding customers will be followed by an overview on the literature of mass customization and Configurators and what they can do in assisting customers in identifying their own solution while minimizing the burden of choice. The guiding research question for this section will be: “What are the tools that help to identify the features crucial for customers’ needs?”

The empirical part will apply the methods and tools, identified in the previous section, on the Austrian Greenhouse Gas Inventory. This will be undertaken by a strategic analysis of market opportunities and an assessment of current and potential customers followed by an assessment of the capabilities needed to apply the principle of mass customization to the current production. The selection criteria and the methodology will be described and key findings given. The guiding research question for this section will be: “How can the customization challenges to Austrian Greenhouse Gas Inventory be addresses by management tools?”

All the above should be combined in the following section that presents the results of the above analysis as a basis for draft specifications for a configurator of the Austrian Greenhouse Gas Inventory (see Figure 1: Investigation Sequence). The guiding research question will be: “What are the strategic options to overcome the customization challenge and develop specifications for a configurator of the Austrian Greenhouse Gas Inventory?”

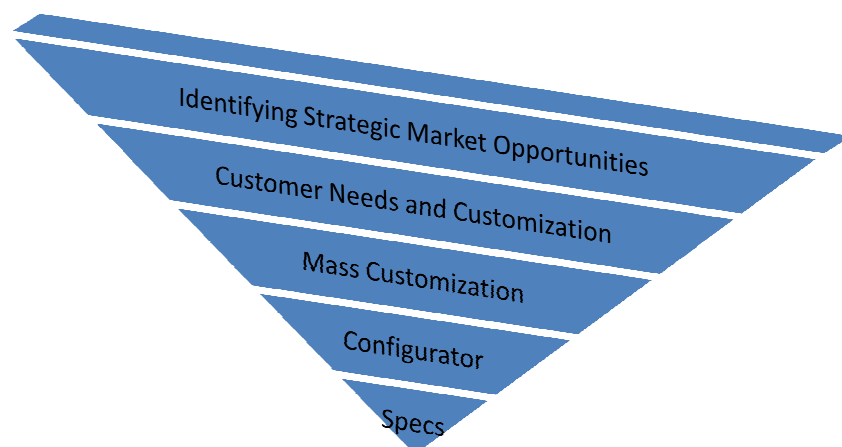


Figure 1: Investigation Sequence

This final section will conclude by summarizing previous sections and extend these via draft recommendations for revising the process architecture and the follow-up within Umweltbundesamt.

2. LITERATURE AND METHODS

SELECTED APPROACHES TO IDENTIFY AND OVERCOME CUSTOMIZATION CHALLENGES FOR THE AUSTRIAN GREENHOUSE GAS INVENTORY

This chapter presents methods and tools appropriate to understand customization challenges peculiar to the specific organizational and legal context of the Austrian Greenhouse Gas Inventory. It reviews approaches described in strategic management and marketing to utilize market opportunities and to customize production processes.

The methods described in this chapter focus on the three aspects that are specific for the Austrian Greenhouse Gas Inventory. This is, for one, the fact that the Inventory is a product within a non-profit organization, with a corporate strategy that is currently under revision to open-up to new market opportunities. Chapter 2.1 therefore describes approaches in strategic marketing that help in aligning market opportunities with the overall strategy of an organization that is not primarily geared towards profit but still needs to ensure sustainable funding.

The second aspect is that there is currently only one main customer for the inventory, which is the Ministry of Environment. Chapter 2.2 therefore looks at methods and tools that help in identifying (other) customers' needs and how a customization process would look like for expanding the customer base beyond the current main customer.

The third aspect is that the Austrian Greenhouse Gas Inventory is a well established product with a clearly defined production design, whose change could entail excessive costs. Chapter 2.3 and 2.4 therefore look at mass customization and the concept of Configurators as a framework for achieving customization while maintaining the relatively low production costs of the existing design.

The investigation sequence follows these three main aspects of the Austrian Greenhouse Gas Inventory. It will start with a review of methods that help in addressing strategic aspects within the specific context of a *non-profit organization* (chapter 2.1), followed by concepts that help in addressing the *specific customer situation* of the Austrian Greenhouse Gas Inventory (chapter 2.2). The aspect of a *well established production design* is addressed in chapter 2.3 and 2.4 through the concept of mass customization and Configurators.

2.1. STRATEGIC APPROACHES TO ANALYZE MARKET OPPORTUNITIES

Customization challenges and market opportunities can only be judged against the background of the strategic goals and ambitions a company has. This is particularly true for the non-profit context of the Austrian Greenhouse Gas Inventory. Chapter 2.1 tries to clarify the way business literature on strategic management deals with the complexity of defining goals (for profit and non-profit) and how this is used as a yard-stick to compare different options in corporate strategies. This is followed by a summary of the main

approaches for market- and resource-oriented strategies and a reference to other approaches that might be helpful to identify customization challenges from the specific perspective of marketing and innovation.

All the approaches presented here are linked by their ability to help in identifying customization challenges for the Austrian Greenhouse Gas Inventory with a primary focus on the non-profit character of the inventory. It reviews and summarizes literature on strategic management that deal with the impact that non-monetary long-term goals have (or should have) on the available strategic options of a company. The approaches that deal with this relation between goals and available options will later on (in chapters 3 and 4) be used to identify the specific customization challenges of the Austrian Greenhouse Gas Inventory.

2.1.1. Long-term Goals and Strategic Options

Most books on strategy and marketing focus resolutely on the pursuit of long-term profitability as the fundamental goal of business enterprises (and therefore also of customization). While acknowledging that making money is not the primary purpose of most firms, they work under the assumption that 'long-run profitability and survival require that the business reconciles itself with the social, political, and cultural forces that have an impact upon it' (Grant, 2008, S. xiii).

The creation of value (for the society) is seen as the main purpose of a firm and measured by the price customers are willing to pay for a good or service. The responsibility of a firm to all other stakeholders (employees, customers, society, and the natural environment) is simplified by the conclusion that 'companies operate in the interest of their owners by seeking to maximize profits over the long term'. There are several considerations that are named as justification, one being the simplicity of using other tools, i.e. that 'virtually all the major tools of business decision making, from pricing rules to discounted cash flow analysis, are rooted on the assumption of profit maximization' (Grant, 2008, S. 36). A wider consideration of stakeholders and their different interests/goals would result in vastly increasing complexity.

Considering the effect of time ("a future dollar is worth less than a dollar today"), profit maximization becomes maximizing the net present value of future free cash flows to the firm. These are discounted at the firm's cost of capital (weighted average costs of equity and debt). Free cash flow is measured as net operating profit plus depreciation less taxes less investment in fixed and working capital. This approach can be used to evaluate alternative strategies or market opportunities by calculating so-called Real Option Value.

And then there are a number of other performance measures for forward-looking assessments. Expected cash flows in the future are approximated by stock market value which however 'tends to be volatile and strongly influenced by expectations about the economy in general' (Grant, 2008, S. 46). Backward-looking indicators are the so-called

accounting ratios like Return on Invested Capital (ROIC), Return on Equity (RoE), Return on Assets (RoA), Gross Margin, Operating Margin, and Net Margin.

There is one fundamental condition that needs to be fulfilled in order to apply the method of discounting cash flows. It needs a society where 'everyone in principle can believe that an agreement will be kept'. That 'at every stage in the future it would be in the interest of each party to plan to keep his or her word if all other were to plan to keep their word' and that at 'every stage of the agreed course of actions, each party would believe that all others would keep their word' (Dasgupta, 2007, S. 31). The state and its institutions like Umweltbundesamt have an important role to play in ensuring that there is enough trust in society to be able to use the discounted cash flow analysis.

Beyond Profit

The financial crisis in 2008 brought back a more fundamental discussion on the role of economy within society. The draw-backs of profit-maximization disregarding other goals came stronger into focus. Some see at the root of the problem that the relationship between economy and society as such became fuzzy (see e.g. (Ulrich, 2009)). The root-cause being that economy is no longer seen as "Mittel zum Zweck" (used for a reason) but rather as a sense in itself. Society is seen as an appendix to economy where the actors within society feel helpless and see no other choice or option to change the fundamental rules on which it works ("Denkzwang – Sachzwang").

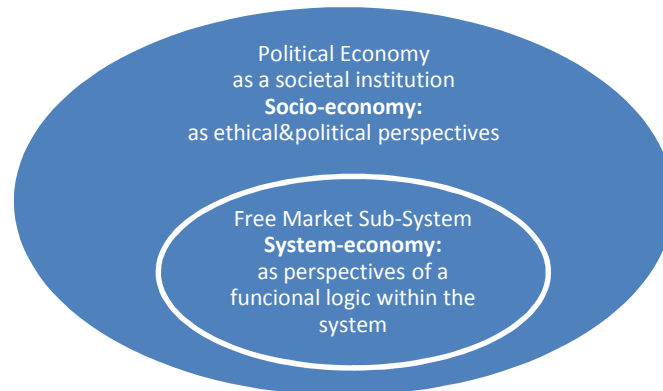


Figure 2: Society and market-driven sub-system as part of a concept for a civil-economic education "Konzept wirtschaftsbürgerlicher Bildung" (Ulrich, 2009, S. 20)

Ulrich (2009) argues that, from a philosophical and ethical position, individuals need extended rights that cover the fact that they can only act in the free market under the condition that they maximize their private benefit. This condition is often in conflict with Kant's imperative that all persons have to be treated with the same dignity and rights. The 're-socialization of the free market' therefore firstly includes a firm integration of the free market by a new set of personal rights that relate to the socio-economic pre-requisites needed by individuals. And secondly, an establishment of moral

principles that ensures that private profit is only legitimate to a point where they comply with a legitimate purpose of society (see Figure 2) (Ulrich, 2009, S. 15ff).

This is acknowledged by management literature on a very pragmatic level: ‘... even more worryingly, such alternative goals [other than profit] may be better, both for society and maybe even for the firm itself’ (Grant, 2008, S. 54). The issue is tackled under the heading of Corporate Social Responsibility which can be used as a basis for the overall strategy of a firm. ‘Strategy is about creating purpose and unifying the energy and creativity of organizational members in pursuit of that purpose’ (Grant, 2008, S. 61) and this strategy might be more successful if based primarily on social values and not on maximizing profit. ‘Profit is not a goal that inspires organizational members to outstanding achievements. Businesses that have been most successful in generating profits have typically been those driven by ambitions other than profit’ (Grant, 2008).

But defining long-term goals and strategic options can be more complex for a non-profit organization. In a conventional company, money is usually taken directly from the customers – making this their main source of direction. ‘In a non-profit, the money may come not from the clients—the homeless, say, or the elderly—but from a mixture of grants, donations and charges’ (Salamon & Anheier, 1998).

Strategic Options

The previous two sections argued that, even for normal profit-driven firms, there is more to strategic management than a “quest for profit”. Fast and far-reaching changes in the business environment create risks that have to result in changes within the company to secure existing and create new potentials for success. Grant (2009) stresses the point that, for Contemporary Strategy Analysis, it is important to shift the focus from strategy as a plan to strategy as direction. It is not the detailed actions but rather plans, policies, and principles that guide and unify a number of specific actions (see Figure 3 on the different levels of strategic management).

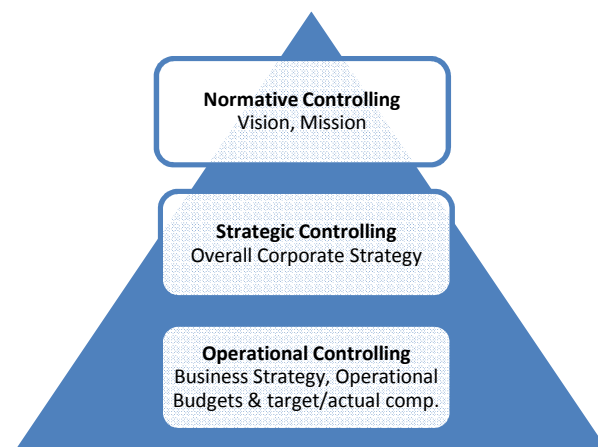


Figure 3: Design levels of Strategic Management, adapted from (Hoffmann, 2009)

On a pragmatic (tool) level, the essence of strategy is to make the right choices. Major areas of the choices in strategic management are the *corporate strategy* and *business strategy*. The former addresses the question of “where to compete”, the latter the question of “how to compete”. Corporate strategy is seen mainly as the responsibility of top management - business strategy as the responsibility of division management.

Empirical evidence suggests that there are common elements to a successful corporate strategy. Apart from effective implementation, they need to be simple, consistent and long-term and be based on a profound understanding of the competitive environment and the resources available within the firm. The latter includes the notion of the *strategic fit*. ‘For a strategy to be successful, it must be consistent with the firm’s external environment, and with its internal environment – its goals and values, resources and capabilities, and structures and systems’ (Grant, 2008, S. 13).

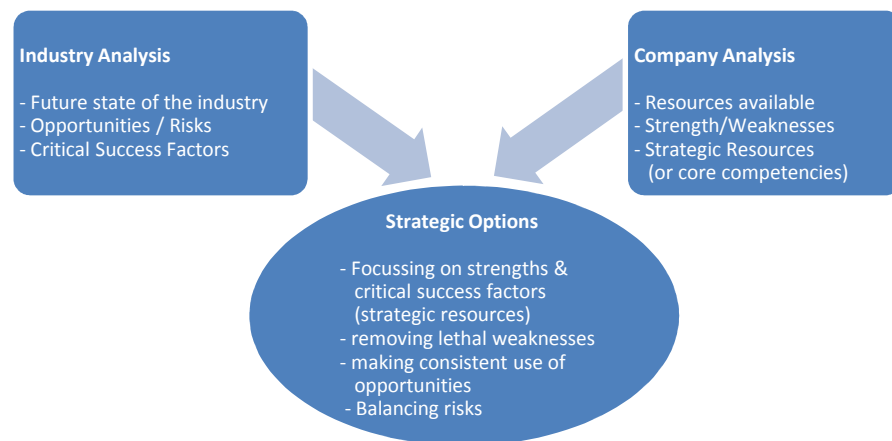


Figure 4: From Analysis to Strategic Options, (Hoffmann, 2009)

From a conceptual point of view, strategies can be either seen as market-oriented, i.e. based on opportunities outside the company, or resource-oriented, i.e. based on the resources available within the firm that are unique and difficult to imitate or substitute. These two different perspectives in strategy are subsumed under the heading of *industry analysis* or *company analysis*.

Strategic options are then, in a further step, based on a combination of the “inside-out” perspective from the analysis of the environment and on the “outside-in” perspective of a company analysis (see Figure 4).

2.1.2. Three Basic Concepts for Market-Oriented Strategies

The Industry Analysis with Porter's Five Forces of Competition Framework, Corporate Foresight, and Identifying Key Success Factors

A successful strategy in the end needs a profound understanding of the competitive environment. The industry analysis wants to determine the attractiveness of an industry. In the logic of profit maximization, this is the profitability of different industries. The industry patterns are defined by the systemic influence of the industry's structure and the legal framework within it works. 'Particular high rates of profit often result from industry segments dominated by a single firm. These niche markets provide attractive havens from the rigors of fierce competition' (Grant, 2008, S. 69).

Porter's Five Forces of Competition Framework classifies and analyses the intensity of competition and the level of profitability. The framework distinguishes between three sources of horizontal competition (from substitutes, established rivals, and new entrants); and between two sources of vertical competition (suppliers and buyers).

The strength of each of these forces is determined by either the threat of substitutes, rivals and new entrants or the bargaining power of suppliers and buyers, such as relative prices and performance of substitute. The boundaries of the industry are typically guided by the question of what firms compete to supply a particular market. This in the end is what can substitute either demand or supply.

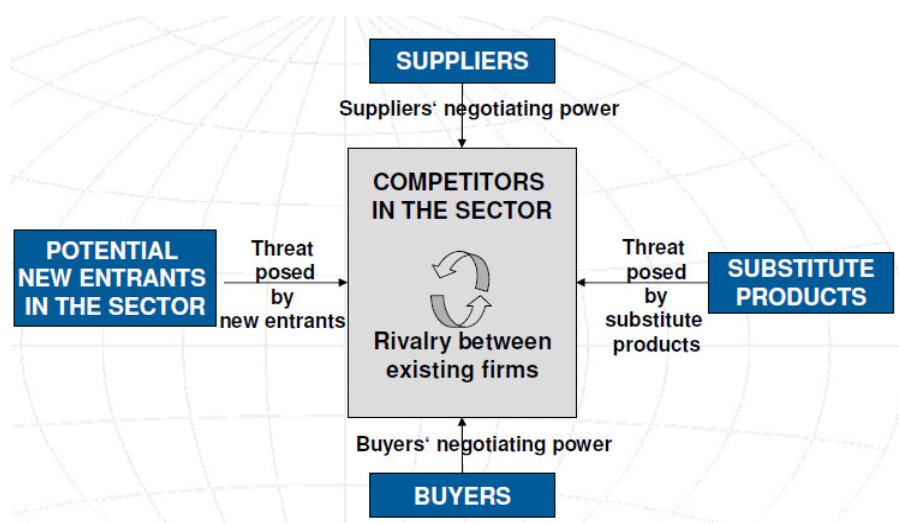


Figure 5: Porter's five forces of competition, (Porter, 1980), as quoted in (Hoffmann, 2009)

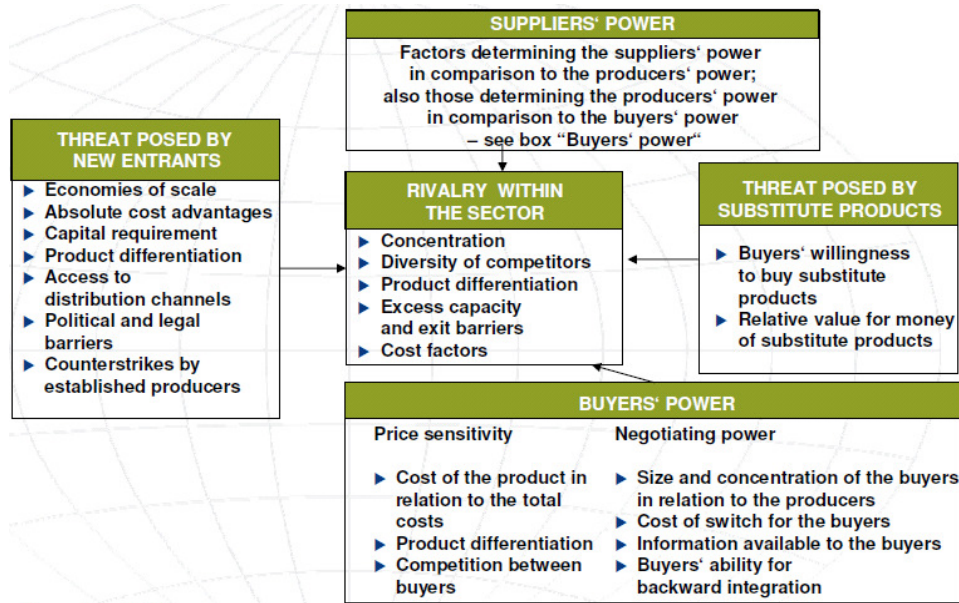


Figure 6: Structural determinants of Porter's five forces model, (Porter, 1980), as quoted in (Hoffmann, 2009)

More important than the current rivalry within the industry is the future state of competition. Future profitability can be predicted 'using structural trends in an industry to forecast the likely changes in competition and profitability' (Grant, 2008, S. 81). This approach is based on three steps. The first is an evaluation of the current industry's structure, followed by the identification of the specific trends that are likely to change the current industry's structure (e.g. are there new players, will capacity overrun growth, will there be a change of dominant design, etc). The third step is an identification of the influence of these trends on the five forces of competition and determine the overall impact of the possibly diverging trends.

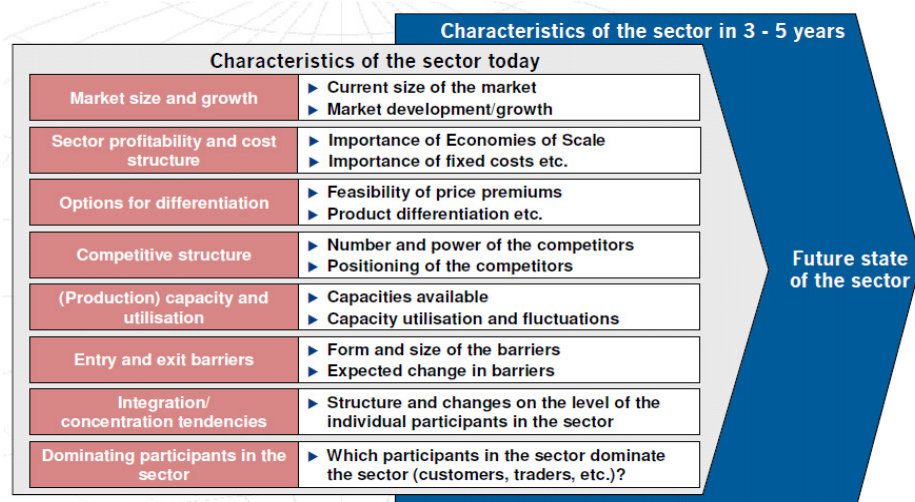


Figure 7: Predicting Industry Future (Grant, 2008), as quoted in (Hoffmann, 2009)

Corporate foresight is a popular term used for predicting industry evolution and taking care of provisions for the future. 'It is the institutionalized generation of strategically relevant forecasting knowledge with the aim of establishing long-term above-average performance in firms' (Martin, 1995). The key insight is that firms need to explore uncertainty, and by this improve their foresight and their competitiveness.

Forecast tools can be characterized by the dominant logic on which the output is based (see Figure 8). Research shows that despite the wide range of different industries and areas of application, three methods are dominant: Monitoring/Scanning, Delphi Analysis, Scenario Analysis (Gruber & Henkel, 2009).

Dominant CF-Paradigm	Expert-based Foresight	Model-based Foresight	Trend-based Foresight	Context-based „Open“ Foresight
Assumption	Knowability by Expertise	Calculability by Models	Projectability by Developments	Shapability by Interaction
Key Characteristics	Belief in Experts dominant, but: 70s: Turn to the qualitative and wider environment First Opening towards "soft sciences" Scenarios	Quantitative and "subjective" models Extrapolation Systems Dominated by "hard science"	Trends Weak Signals Early Warning Mix of qualitative and quantitative Indicators	Integrating "soft" and "hard" approaches Understanding & interpreting / evaluating change Opening up: Participation, interaction & process Action- and innovation-oriented More attention on discontinuities
Perspective	Exploring Change	Calculating Change	Reacting to Change	Understanding & Anticipating / Shaping Change
Output	Delphis, Roadmaps, Scenarios	Models & Matrixes	Trend-databases Monitoring Systems	Scenarios; Wild Cards; Action Plans & Innovation Ideas

Figure 8: Characteristics of Corporate Foresights, (Daheim/Z-Punkt, 2008), as quoted in (Gruber & Henkel, 2009)

Corporate forecasts give an approximation of the future potential for profit of a particular industry. But it will be crucial for a specific firm, how this profit is going to be distributed among the firms within the industry.

The factors defining this distribution can be addressed by the concept of *key success factors*. 'By first identifying the probable key factors of success and then screening them by proof or disproof, it is often possible for the strategist to penetrate very quickly to the core of a problem' (Ohmae, 1982, S. 85).

This is on the one hand guided by the question of "What do our customers want" and on the other hand by the question "What do we need to survive competition". The first question requires a closer look at the customer as the final reason that the company exists. It is important to establish who the customers are, what are their needs, and on what grounds they choose between a product/service and that of other firms. The basic customer preferences are used as a starting point for further assessment along the chain of decision. The second question refers to the intensity of competition and how we can obtain a superior competitive position.

2.1.3. Three Basic Concepts for Resource-Oriented Strategies

Value Chain Analysis, Concept of Technology-Push, and Knowledge Management

It is not always straightforward to draw up the key resources and capabilities within a firm. The key success factors (see above) are a good starting point, as they define why firms are more successful than others in a specific industry. The next step would be to determine what resources and capabilities these factors are based on. These can then be listed and analysed along a set of parameters (see Figure 9), to determine if they are valuable, rare, difficult to imitate, and output-oriented (VRIO). The VRIO model takes a look at the relative strength and importance of resources, which methodically e.g. can be based on benchmarking.

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 9: The VRIO model (Barney, 1997), as quoted in (Hoffmann, 2009)

Another possibility is to analyse the strength and weaknesses along the *value chain* (see Figure 10), and to combine it with the VRIO framework above.

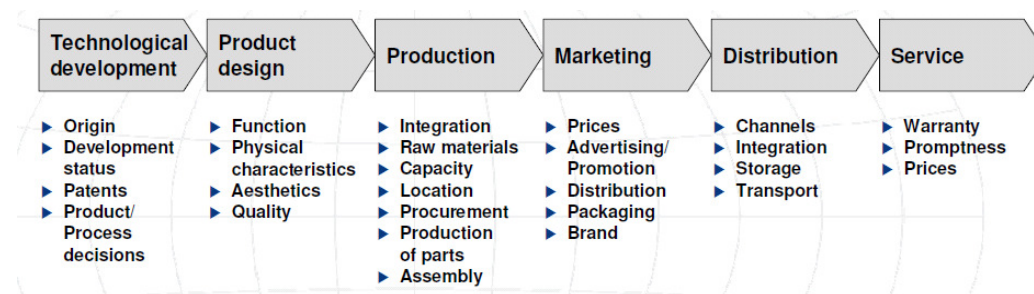


Figure 10: Value Chain Analysis (Barney, 1997), as quoted in (Hoffmann, 2009)

The outcome/combination of these two tools will then be the basis for formulating a strategy that ensures that the key strengths are exploited to the best advantage and that key weaknesses are managed to minimize their impact.

The *concept of technology-push* looks at technologies as key resources. Strictly speaking, it is not a sole tool for resource-oriented strategy alone, since it also looks at the market. It is included here nonetheless because it starts out by recognizing the technology as a capability within the organisation as a starting point. One key observation here is that technology is often developed before market applications exist. These technologies are then in a need for a customer (technology-push) in contrast to a demand from the market (market-pull, see also chapter 2.1.5).

Market Pull: ...starts with a need	Technology Push: ...starts with a technology
<u>Principal Issues:</u>	<u>Principal Issues:</u>
<ul style="list-style-type: none"> – Verify need (customer data!) – Find technological solution to serve the need – Scalability & ramp up of production – Reach customers (distribution) 	<ul style="list-style-type: none"> – Identify market applications – Verify the customer needs in the identified markets – Evaluate the product-market combination – Decide on commercialization strategy & determine technological embodiment (targeted R&D, specific product) – Further steps depend on commercialization strategy

Figure 11: Technology-push vs. market-pull, (Gruber & Henkel, 2009)

Another way of considering resources, capabilities, and their management has been to look at value generation from knowledge through *knowledge management*. ‘A useful starting point is to identify the linkage between knowledge and the basis on which the firm creates value. This can then highlight the key processes through which knowledge is generated and applied’ (Grant, 2008, S. 164f).

That there are different types of knowledge with different characteristics is one of the important things to recognise. The “know-how” primarily involves skills that express performance and are tacit in nature, whereas “knowing about” is about facts, theories, and instructions which are explicit, i.e. can be transferred easily from individual to individual. This distinction can be used for formulating strategy through acknowledging that explicit knowledge alone is seldom a basis for sustainable competitive advantage.

Another important outcome of the knowledge-view is to understand the processes through which a firm develops and applies knowledge. Two categories can be identified: one that is concerned with increasing the available knowledge (“exploration”) and one that is applying the organization’s knowledge (“exploitation”). ‘This shift in the knowledge base of the firm, from tacit knowledge located in individuals to explicit knowledge held by the organization, is fundamental to the transformation of craft

enterprises into industrial enterprises' (Grant, 2008, S. 164) and see also chapter 2.3.2 on "sticky information".

2.1.4. The Marketing Perspective on Strategy

Marketing by definition refers to all that an organization does to create or exchange value with customers. This is a comprehensive approach with a focus on creating and serving a customer, bringing about an intended overlap with corporate strategy and the different functions of a company which in the end leads to an attitude that is focused on the benefit provided for the customer.

'There is only one valid definition of business purpose: to create a customer [...]. [Therefore], any business enterprise has two – and only these two – basic functions: marketing and innovation' (Drucker, 1954).

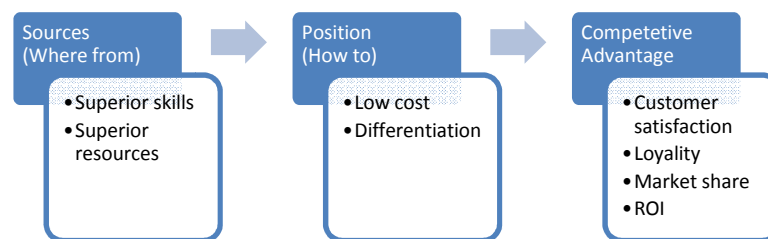


Figure 12: Marketing view on the sources of competitive advantage (Pitt, 2009)

The *marketing concept* as a tool describes the overall process of marketing and gives mnemonic help in remembering the important issues to be addressed. The approach is similar to the tools described above (see 2.1.2 and 2.1.3) but gives a stronger focus on the customer and on a holistic view of the whole business.

The process starts with the analysis of the market by 'selecting a target market and determining the desired positioning of the product in the customers' mind' (Silk, 2006, S. 3). This is then followed by a plan that specifies the activities needed to achieve the desired positioning.

The main questions underlying marketing decisions are (Silk, 2006):

- What are the customer needs – and what needs do we seek to satisfy (customers)?
- What are the company skills – and what is our specific competence to meet the needs of the customer (company)?
- Who competes with us in meeting the customer needs (Competitors)?
- Whom could we find to help (Collaborators)?
- Which cultural, technological, and legal factors limit our possibilities; who competes (Context)?

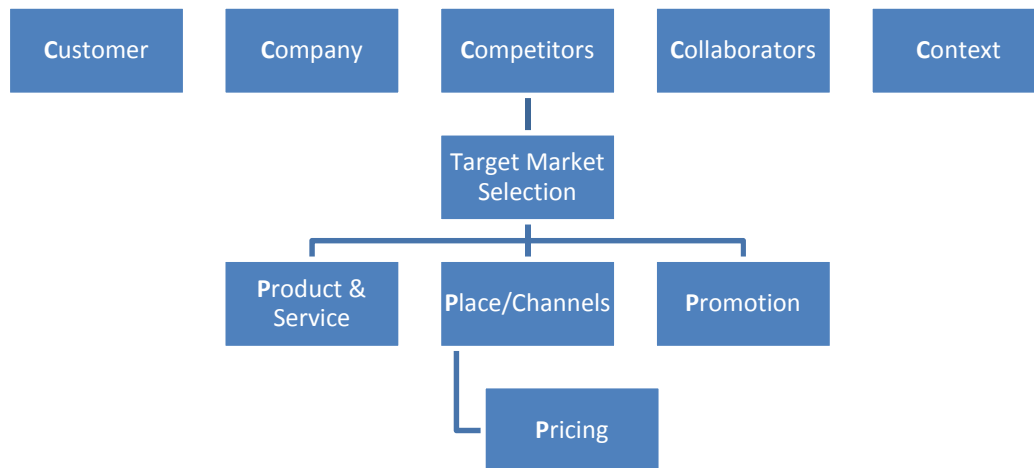


Figure 13: Schematic of the marketing Process: the 5 C's of marketing analysis and the 4 P's of the marketing mix (Silk, 2006)

The two key questions for the target market are (Silk, 2006, S. 6):

- Which potential buyers should the company attempt to serve?
- How much customization should the company offer in its programmes (mass market – market segments – market niches – individuals)?

And for the marketing mix (Silk, 2006, S. 8ff):

- What is our product and what value does it offer? What is the impact of the product for the “product line breath” and “product line length” (product)?
- What policies and procedures will be used to have the necessary functions for channel design and channel management (Place)?
- What is the proper allocation of resources across different (media) vehicles (promotion)?
- What is the optimal price to acquire or retain a customer (price)?

To formulate a marketing strategy, it is important that the organization ‘learns to think of themselves not as producing goods and services but as doing things that will make people want to do business with them’ (Levitt, 1960). The core is the question about “what business are we in?” This question has to be answered in a broad sense before a target market can be selected.

2.1.5. The Technological / Innovation Perspective on Strategy

The focus of strategic innovation management is on tools to examine the link between technology, innovation and the firm’s overall strategy. It places the technology analysis on the same level as the competition analysis for the formulation of an innovation strategy. Its purpose is to ‘acquire and interpret information about innovation-related technology faster than competitors’ (Gruber & Henkel, 2009).

The methods described below are not applied in-depth in the following chapters of this thesis. There are nevertheless presented here as they provide an important framework for the potential further customization process of the Austrian Greenhouse Gas Inventory seen as a new product development.

In this context, it is important to note that strategic innovation management faces different challenges with increasing “newness” of the underlying innovation (Gruber & Henkel, 2009):

- Incremental innovation; small improvements
- Significant product improvements; technology hardly changed
- Radical innovation; new technology.

Radical innovations can be disruptive in nature, i.e. they can change existing industry patterns drastically. ‘One of the most consistent patterns in business is the failure of leading companies to stay at the top of their industries when technologies or markets change’ (Bower & Christensen, 1995). There is some risk that radical innovations will be overlooked by well established companies that are close to their existing customer but might not realize the challenge from a completely new technology (I-Pod versus Walkman).

The *technology analysis*, as one of the tools used by innovation/technology management, monitors the state of scientific and technological evolution and the impact on the company and its technological competencies. But it also includes a comparative evaluation of how the potential of a specific technology will evolve and how the needed competencies and capabilities can be obtained. The S-shaped development of a technology is seen as a crucial early indicator of when a switch to a new technology will occur.

The underlying assumption of the *S-curve method* is that the technological performance of a specific technology evolves in the form of an s-curve along aggregated R&D spending or time. The new technology starts out with a lower technological performance, but overtakes the old technology at some point of time - only to be overtaken herself when the new technology reaches its limit (Christensen, 2009).

A related principle is applied in the principle of the dominant design. ‘A *dominant design* in a product class is, by definition, the one that wins the allegiance of the marketplace, i.e. is the one that competitors and innovators must adhere to if they hope to command significant market following’ (Utterback, 1994, S. 24). The early recognition of a dominant design helps in formulating an innovation strategy.

Other tools related to technology are *Technology Monitoring* and *Roadmapping*. Both tools are methods for forecasting and visualizing the development of technologies as a basis for strategic management. The assumption is, that technologies are easier to forecast than markets because they allow one to see major shifts in technology and disruptive innovations earlier on (Gruber & Henkel, 2009).

Another tool to link technology with a specific market application is the process of *technological competence leveraging*. This follows the idea that ‘technologies are often amendable to uses for a range of markets, but yet are often underutilized’ (Danneels, 2007). The process of leveraging technological competence is seen as consisting of two steps. Firstly, the step of disembodiment of the technological competence from its current product application (*de-linking*) and secondly, to apply the competence to serve new markets (*re-linking*). The presence of a competence to serve current customers and the lack of competence to gain access to new customers are the main drivers for hindering de-linking and re-linking (for more on technology-push see 2.1.3).

2.2. CUSTOMER BEHAVIOR AND CUSTOMIZATION PROCESS

Whatever the strategy to analyze market opportunities (see previous chapter 2.1), a superior understanding of customer behavior and needs is one of the pre-requisites for a successful business. Organizations’ ability to satisfy clients is critical not only for profit-oriented businesses but also for non-profit organizations that ultimately have to satisfy a variety of customers (like the representatives of government, voters, the media or even serve the general public interest).

This chapter introduces concepts and tools that help in understanding customer behavior and the customization process with a focus on the specific situation of the Austrian Greenhouse Gas Inventory, i.e. a situation where there is currently only one main customer for the Inventory, which is the Ministry of Environment. Chapter 2.2 presents approaches that help in identifying customization challenges in expanding the customer base beyond the current main customer.

This is done through a review of approaches that help in understanding (other) customer needs (chapter 2.2.1) and the general/theoretical framework of the customization process as such (chapter 2.2.2). The final sub-chapter 2.2.3 gives an overview on the approaches that help in identifying customization challenges from the perspective of a new product development. This is in view of the possibility that the customization of the Austrian Greenhouse Gas Inventory might lead to the development of new products.

2.2.1. Customer Needs and the Buying Process

Is it morally questionable to use knowledge about human nature to sell services and products that might not be in their best interest? Leaving this question aside, the ‘concepts and research in the humanities and various social and biological sciences can enlighten a firm’s understanding of customers and hence its ability to anticipate and shape customers’ behaviors’ (Silk, 2006, S. 52).

This chapter highlights three concepts that might be helpful in understanding customer behavior and needs. These are (1) the performance gap, (2) the key roles in the buying process, and (3) the concept of attitude formation.

The Performance Gap

In marketing literature, a need is referred to as a discrepancy or gap that 'may be perceived between an actual and a desired state of being' (Silk, 2006, S. 71). This need or perceived gap is generally called a "performance gap", since "need" as a term has many different meanings.

This performance gap can only be experienced if external stimuli (information received) and internal stimuli (discomfort from the desire to avoid risk, the wanting to belong, or the seeking to achieve) are strong enough. And this performance gap widens or narrows with individual perception, not with the actual situation as such.

'Many new goods and services are unsuccessful or less successful than they could be because a firm fails to understand (1) customer perceptions of current states; (2) customer perception of desired, feasible states; and (3) what influences these perceptions. Likewise, understand what activates or influences customers – that is, what arouses, channels, and sustains customer behavior, particularly when latent or emerging needs are involved' (Silk, 2006, S. 72).

However, understanding all these complex desires can be very challenging. But this is where the competitive advantage might lie, i.e. in being able to understand customers better than others. The main hurdles for managers to understand customers is the fact that needs have no meaning by themselves but can only be understood within a specific context. This context can have a sociological, psychological, or physiological meaning – and this complexity brings about a process of approximation by the manager rather than logical inference. '[B]y carefully examining their own personal experience, managers can formulate initial ideas, obtain feedback, develop more specific ideas, obtain additional feedback, refine ideas still further, and so on. Thus managers can proceed from exploratory thinking, to developmental thinking, to confirmatory evaluations using experience and formal methods of market research together' (Silk, 2006, S. 74).

Key Roles in the Buying Process

The decision making process can be divided in different stages that involve specific cognitive and social processes. The *Hierarchy of Effects* model distinguishes between

- (1) the initial awareness of a product or service,
- (2) the development of further knowledge about it – leading to beliefs about the product or service, and
- (3) the emergence of a particular feeling about the product or service - that brings about the decision to buy or refuse.

As customers have limited capacity to evaluate and process information, they use simplifying strategies to make the choice easier for them. 'One of the simplest strategies is called *actual referral*. In this strategy customers do not even bother to examine specific attributes of the product but instead use an evaluation they recall from the past' (Silk, 2006, S. 68). And then there are more complex strategies used by customers that range from deciding on the most important attribute to a weighing of each of the attributes, that can be done in a phased approach; i.e. an approach where the customer uses a simple strategy to select a few attributes and then uses a more complex strategy for a further selection.

Often, there are more people than one involved in the buying process. In organizations, the buying process often involves people in different departments. Together they are called the *buying center*. The type of involvement in a buying centre affects the decision making process, since it is different if one person decides alone, or if e.g. a separate purchasing department is involved.

Among customers, there can be a number of different roles distinguished. *Opinion leaders* as people whose judgment is sought by others; *market mavens* who can provide cross-category advice; *innovators* as among the first to try; *gatekeepers* who influence information flows; *decision makers* who authorize purchase; *implementers* who execute purchase, and finally *users* who consume the product or service.

Forming of Attitudes

'Attitudes are general evaluations of a brand of product that are based on information and experience. They are carried in memory and help customers to differentiate offerings into acceptable and unacceptable sets. When attitudes do not exist in memory, customers attempt to form them' (Silk, 2006, S. 66). *Fisbein's multiattribute attitude* model assigns a probability to each belief about a brand. By multiplying the belief with the probability and then adding it up this leads to a quantification that represents the attitude towards an object (Fishbein & Ajzen, 1975).

The interesting point in Fisbein's model is that it gives some clue about how marketers can change customers' attitudes. This can be either done by changing the beliefs about the product but also by changing the probability value that customers assign to the belief, e.g. by strengthening indirect experience through the social system about the reliability of your product. 'One of the most intriguing and important patterns of human behavior is the tendency of people to differentiate themselves from one another and yet to group together on the basis of important similarities' (Silk, 2006, S. 75). This pattern is central to marketing strategy and the segmenting of markets (see chapter 2.2.2).

2.2.2. The Customization Process

The marketing perspective on strategy (see also chapter 2.1.4) very much focuses on creating and maintaining customers, i.e. is a customization strategy almost by definition.

The overall steps are outlined in Figure 13, showing that after getting a good understanding of consumer behavior, the next important task is to select the ideal target market. This is done by positioning the product or service within a pre-defined market segment.

Market Segmentation

Market segmentation is the process of grouping all potential customers into segments that have unique characteristics. The segmentation is, in the best case, based on the differentiated benefit expected by customers. If that is not possible to ascertain, it is usually based on other observable characteristics that proxy a specific need (e.g. position, income, previous purchases, gender, age, etc.). It is moreover, 'critical that the segmentation is based on one or more characteristics that are relevant to the firm's marketing effort' (Silk, 2006, S. 86).

The aim is to create segments that can be consistently addressed by marketing and linked to customer benefits (needs). The segmentation therefore requires that the customer benefit is understood and that observable variables are found that can be linked to the benefit; this in practice 'requires quite a bit of experience and creativity. One complicating factor is that there can be multiple acceptable benefit segmentation schemes. In general, a satisfactory, actionable market segmentation typically requires multiple iterations and informed compromises from the marketer' (Silk, 2006, S. 87f).

Target Market Selection

A profit-driven company aims at entering market segments that promise the highest return on investment. To this end, it evaluates the customer behavior (see above), the competitive environment (see chapter 2.1.2), and the capabilities of the company (see chapter 2.1.3). This data has to be collected for each market segment into, what is called in the marketing literature, a *competitor capability matrix* (see also chapter 2.1 on strategic options). The following five general areas to the company and its competitors can be distinguished (Silk, 2006, S. 88f):

- ability to conceive and design
- ability to produce (quality and quantity)
- ability to market
- ability to finance
- ability to manage / execute.

Segments can be rated to lead, in the end, to the selection of a target market where the firm is most likely to be the strongest player. It is however 'important to recognize that this differential advantage analysis facilitates target market selection by pointing out the relative strengths (and weaknesses) of the focal firm, but this analysis does not predict the competitive reactions the firm might face if the firm indeed decides to target a segment' (Silk, 2006, S. 89).

Positioning

Positioning defines the unique selling proposition (USP) of a product or service. It clarifies who the customers are, what need the product or service fulfills, and why it represents the best choice for the customer. The USP is typically formalized in a *positioning statement* that is primarily directed at the customer. 'This statement has a guiding role in the development of the marketing role – marketing practitioners often say that "solving" the positioning problem enables a company to solve its marketing mix problem' (Silk, 2006, S. 90). Well phrased, the positioning statement helps to focus employees on the customer and is therefore important for internal communication within the firm.

But it should not only articulate the customers need, but ideally also present a clear *differentiation* from competition. Management literature distinguished between *vertically differentiated*, that is if buyers agree that the product or service is better than those from competitors, - and *horizontally differentiated*, if the customer chooses the product independent of the products or service quality. In practice, these two are always linked and are addressed together.

The value of a brand is an expression of the differentiation for a product or service. At a minimum, *branding* ensures that the offering can be at least distinguished from another, as a maximum it stands for the category itself (e.g. "tempo" for handkerchiefs).

2.2.3. Customization and New Product Development

The new product development process is usually staged into six steps that are:

- (1) idea generation and screening,
- (2) specification,
- (3) concept,
- (4) detailed design,
- (5) prototyping (testing), and
- (6) launch.

All of these can be linked in some way or another with the customer and the needs to be addressed by the new product or service.

The innovation process requires information about the customer ("need information") and information about the solution ("solution information"). Ideation and concept development should be based on need information and it is often hard to obtain from the customer ("sticky information"). But it is crucial for improving effectiveness.

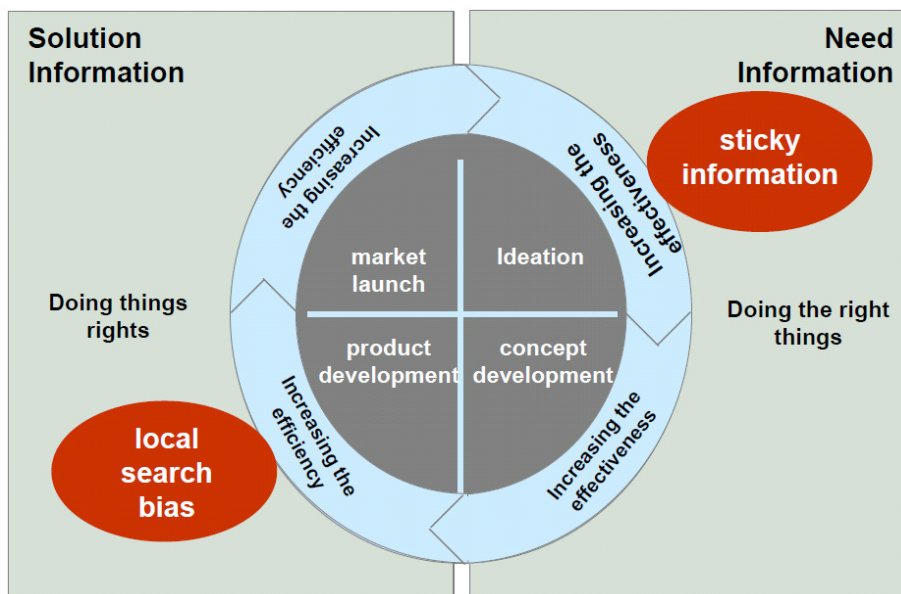


Figure 14: Linking the cycle of new product development with information needs (Lüthje, Lettl, & Piller, 2009)

Product development and market launch should be based on solution information, i.e. on know-how on how the new product or service will look like. This can be biased by the capabilities and expertise that you have in house, the so-called *local search bias*. But is in the end crucial for doing things right and increasing efficiency.

How to Overcome the Sticky Information Problem

'The stickiness of a given unit of knowledge or information is defined as the incremental expenditure required to transfer that unit from one place to another, in a form that can be accessed by the recipient. When this expenditure is low, information stickiness is low; when it is high, stickiness is high. By implication, sticky information is harder to move' (von Hippel 1994) as cited by (Lüthje, Lettl, & Piller, 2009).

The main problems in transferring information is that there is always a tacit part, i.e. it is difficult to tell someone how to ride a bike and that it always involves transaction costs (see also chapter 2.1.3 on knowledge management). One other main problem is that developers need a lot of information, i.e. there is always something missing in the specification (asymmetric information). And then there is always some kind of mistrust between customer and provider (principal-agent problem)

Depending on the reasons for sticky information there are different possibilities to overcome them (Lüthje, Lettl, & Piller, 2009):

- Coding of the information prevents its understanding:
Investments in better surveys and advances in market research. Examples: focus groups, "outcome driven innovation" method, etc.

- Recipient of information (firm) lacks characteristics to get information:
Partner / outsource market research to specialists. Examples: panels, trend researchers: market for market research
- Sender of information (customer) lacks characteristics to provide information:
Observe, don't ask! Examples: Empathic Design (see below), Usability Studies, product clinics

The product development process greatly differs between different industries. It can start with a well-articulated customer need. But the need addressed by the new product or service might also become apparent only when the customer is brought into contact with it.

Level of user involvement

Management literature distinguishes between a number of methods for involving the customer in product development. Kaulio (1998) presents a framework, in which these methods are related to the phases of the design process. It groups the level of customer involvement in three categories (see Figure 15):

- Design for: where products or services are designed on behalf of the customer
- Design with: lets the customer react to different proposed design solutions
- Design by: where the customer is actively involved and takes part in the actual design

“The issue of selecting methods for customer involvement in product development is, however, not a matter of selecting a specific method, but a matter of designing a whole system of methods linked together in an overall process that focuses design efforts on the customer’s future satisfaction’ (Kaulio, 1998, S. 148). A related concept, the “postponement strategy” is presented in chapter 2.3.3 as part of mass customization)

	Specification	Concept Development	Detailed Design	Prototyping	Final Product
Design for	Quality Function Development	Quality Function Development	Quality Function Development	Quality Function Development	Quality Function Development
Design with	User-oriented Product Development	User-oriented Product Development	User-oriented Product Development	User-oriented Product Development	
		Concept Testing		Beta Testing	
Design by	Lead User Method	Lead User Method	Lead User Method	Lead User Method	
	Consumer Idealized Design	Consumer Idealized Design			
	Participatory Ergonomics	Participatory Ergonomics	Participatory Ergonomics	Participatory Ergonomics	

Figure 15: Categorization of methods used in the new product development process (Kaulio, 1998)

Emphatic Design

But then there are firms that fail because they listened too closely to the customer. Often customer needs are not very inventive. They don't know their own needs or are unable to express them. A radical innovation coming from outside current thinking can disrupt a whole industry (disruptive innovation), but would have not been thought of by current customers.

Emphatic design describes a set of techniques that aim at identifying needs that customers don't recognize. It is mainly based on watching customers use products and services in their normal environment and applying the information gathered. However, it needs a lot of expertise, which brings the methodology closer 'to anthropology than marketing science', but '[d]eveloping a deep, emphatic understanding of users' unarticulated needs can challenge industry assumptions and lead to a shift in corporate strategy' (Leonard & Rayport, 1997).

2.3. MASS CUSTOMIZATION

One of the main customization challenges is to maintain near mass production efficiency and costs while producing in-line with individual customers' needs. This chapter presents the concept of mass customization as an approach that might help in identifying and overcoming a specific customization challenge for the Austrian Greenhouse Gas Inventory, i.e. the fact that there is already a clearly defined production design, whose change could entail excessive cost.

This chapter looks in particular at the applicability of the general approach to the whole customization process of the Austrian Greenhouse Gas Inventory, also addressing the non-profit and one-customer character of the Inventory. It thus describes the context of mass customization in more detail in chapter 2.3.1 and presents literature on the practical approaches in chapter 2.3.2. Chapter 2.3.3 deals with approaches that help in defining the best starting point of customization within the value chain and chapter 2.3.4 looks at pragmatic approaches to apply mass customization and the challenges that could be found there.

2.3.1. Context and Definition of Mass Customization

Before the Industrial Revolution in the nineteenth century, most products and services came from craftsman (carpenters, tailors, etc.) that customized for the need of the buyer. The high customization came with a price that derived from the high degree of expertise and manual work involved. Fragmentation of task and a division of labor in nineteenth century brought down labour costs but also decreased the level of customization. Buying Henry Ford's cars from the newly established assembly line, you could 'choose any color, as long as it was black'.

The introduction of the concept of market segmentation brought limited possibilities for customization by covering average clusters of customers' needs (Smith, 1956). 'Hence, manufacturers in the twentieth century were able to choose between two distinct strategies: (1) being a cost-efficient mass producer with limited or no variety; or (2) offering highly customized and often expensive products resulting from a craftsmanship-like approach' (Kaplan & Haenlein, 2006, S. 168f).

The term *mass customization* was introduced in 1987 (Davis, 1987) for mass producing customized products. 'Certainly the basic idea behind this approach is not revolutionary, since customers have always been able to customize certain mass-produced products by choosing from predefined modules as is, for example, the case when ordering a car with special features or a kitchen consisting of parts adapted to specific characteristics of the room or the cooking practices of the user' (Kaplan & Haenlein, 2006, S. 169). But it nevertheless is now used to refer to a distinct school of customization in the management literature.

There is however no commonly accepted definition, save defining it as *mass production of customized goods*. Based on questions related to applicability, role in the value chain, and production cost – the following more generally applicable definition has been proposed in the management literature:

Traditional Mass Customization is a strategy that creates value by some form of company-customer interaction at the fabrication/assembly stage of operations level to create customized products with production costs and monetary price similar to those of mass-produced products (Kaplan & Haenlein, 2006).

More recent literature also includes services in the definition. For the purpose of this master thesis the following simplified definition will be used, based on (Lüthje, Lettl, & Piller, 2009):

Mass customization is defined as providing products and services which meet the needs of individual customers with regard to certain product features with near mass production efficiency.

2.3.2. Approaches to Mass Customization

The aim of mass customization is to provide value to individual customers without adding unnecessary cost and complexity to the firm. This implies taking a careful look at what kind of product features are crucial for the customization process, as not to introduce options that add costs without increasing the value for the customer.

The basic idea behind mass customization is to use an industrial approach rather than a craftsman approach in customizing products and services. The unit costs should in the end be same for small scale as for large scale. The process should be able to handle the differentiated products and services as if they were one and the same.

All operations are performed within a pre-defined solution space, characterized by stable but still flexible and responsive processes. This leads to costs close to mass production while ensuring a relatively high differentiation level.

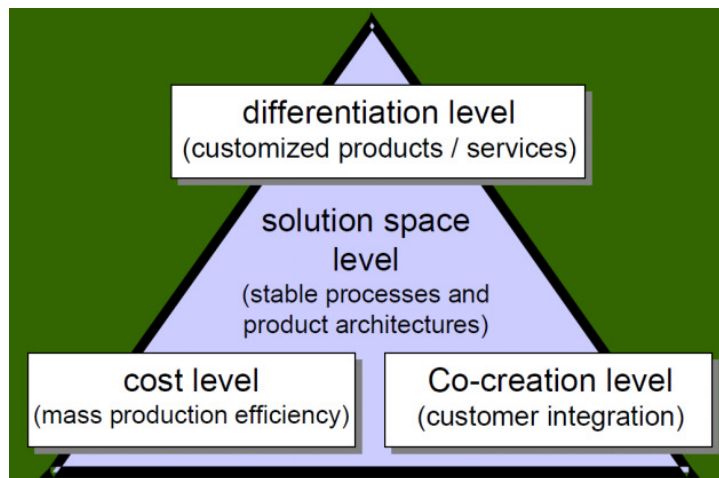


Figure 16: Different aspects of mass customization (Lüthje, Lettl, & Piller, 2009)

Management literature distinguishes between collaborative, adaptive, cosmetic, and transparent approaches to customization.

Collaborative Customization

This is the approach most often understood by mass customization and is the best approach for businesses where it is not easy to articulate the need (“sticky information”) and where customers are not willing to invest a lot of time in choosing their preferred option (“the paradox of choice”).

‘Collaborative customization conducts a dialogue with individual customers to help them articulate their needs, to identify the precise offering that fulfills those needs, and to make customized products for them’ (Gilmore & Pine, 1997, S. 92).

Customers face difficult decisions that will have impacts that can’t be easily foreseen. There are certain trade-offs that have to be considered and weighted together with the producer. The customer needs to participate in the design stage and to play with the options available to him and see what they would result in.

Adaptive Customization

This approach is for products that will be used for very different purposes and the customer wants to customize the product easily on his/her own.

‘Adaptive customizers offer one standard, but customizable, product that is designed so that users can alter it themselves’ (Gilmore & Pine, 1997, S. 93).

The product itself includes a multitude of options that lets the customer decide on the customization and interact directly with the product, and not with the producer.

Cosmetic Customization

This is for customers that use it always the same way but want to look at it differently. It is more a question of packaging than of substance. But this might still add of real value to many customers – especially if this is important for their customers as well.

‘Cosmetic customizers present a standard product differently to different customers’ (Gilmore & Pine, 1997, S. 93).

This approach shows an understanding of the producer, of how the customer wants the product to be presented. It creates a bond between producer and customer in cases where a standard product satisfies almost every customer.

Transparent Customization

This is the approach, if customers’ needs can be foreseen or deduced from other information. It is important when customers do not want to state their needs. This leads to an observation of customers (see emphatic design) without the need for directly asking the customers.

‘Transparent customizers provide individual customers with unique goods and services without letting them know explicitly that those products and services have been customized for them’ (Gilmore & Pine, 1997, S. 94).

It can be annoying for customers to be asked or given a lot of choice. It entails that the producer is willing (or invests the time and money) to deepen the knowledge about the customer’s unexpressed wishes.

Any approach in practice will be a combination of these basic approaches. The general framework can be seen as a guide on how much change in the product or in the representation is needed (see Figure 17).

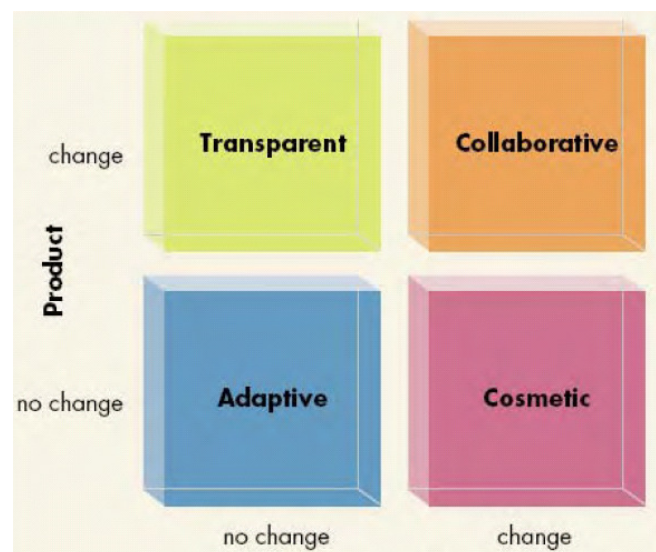


Figure 17: The Four Approaches to Customization (Gilmore & Pine, 1997)

Ultimately however, few companies are able 'to utilize the full span of possibilities for value creation by mass customization. Many managers focus on the customized production process, neglecting the opportunities to aggregate customer co-design information to customer knowledge for innovation and strategic planning. Mass customization and mass production could be integrated in one system – a toolbox for customization along the entire value chain. Critical factor will become the selection of the degree of variability, i.e. customization options, at each level' (Lüthje, Lettl, & Piller, 2009) (see chapter 2.3.4 and 2.4).

2.3.3. *Postponement Strategy*

The main barrier to customization is a lack of customer understanding. The feedback process is different in the engineer-to order (craftsman), mass production, and mass customization approach. The idea of mass customizations is to get a proxy that represents customers' needs. One way of getting a better proxy of customers' needs is by postponing the implementation of features crucial to customization – and therefore bringing it closer to the expressed wish of customers.

The postponement strategy builds partial products up to a "de-coupling point" and waits until actual order signals are received to complete the product or service. The process is started by producing a generic product that can be differentiated later on. As customer demand for a specific end-product is usually uncertain and gets more specific in time, a generic product reduces inventory levels and increases accuracy of demand forecasts.

This indirectly also defines the point of customer interaction along the value chain of product development. The longer a generic production can be upheld, the later an involvement of the customer is needed, thus reducing costs.

Postponement strategies have cost and risk benefits, i.e. they pool risks and use economies of scale, smaller inventories, and have a faster response time. It however demands higher investment in flexible manufacturing and distribution systems and a redefinition of product structures and manufacturing processes.

And more fundamentally, the problem remains that 'conventional postponement strategies do not eliminate the task of a firm to identify and fully understand the user preferences. In markets with high heterogeneity of demand, accessing need information precisely is still difficult and costly' (Lüthje, Lettl, & Piller, 2009).

One strategy to avoid this problem would be to move the de-coupling point into the domain of the user, i.e. ensuring satisfied customers through embedded preferences in the product and distributed product differentiation. There are a number of strategies to cope with the different degree of postponements. (Lüthje, Lettl, & Piller, 2009) name the following methods: Forecasting for *made-to-stock*; Variant Management and Mass Customization for *engineer-to-order*; Collective Customer Commitment and Advanced

Assortment Productivity for *locate-to-order* and *match-to-order*; Embedded Toolkits (flexible, adaptable, open products) for *user manufacturing* – see Figure 18.

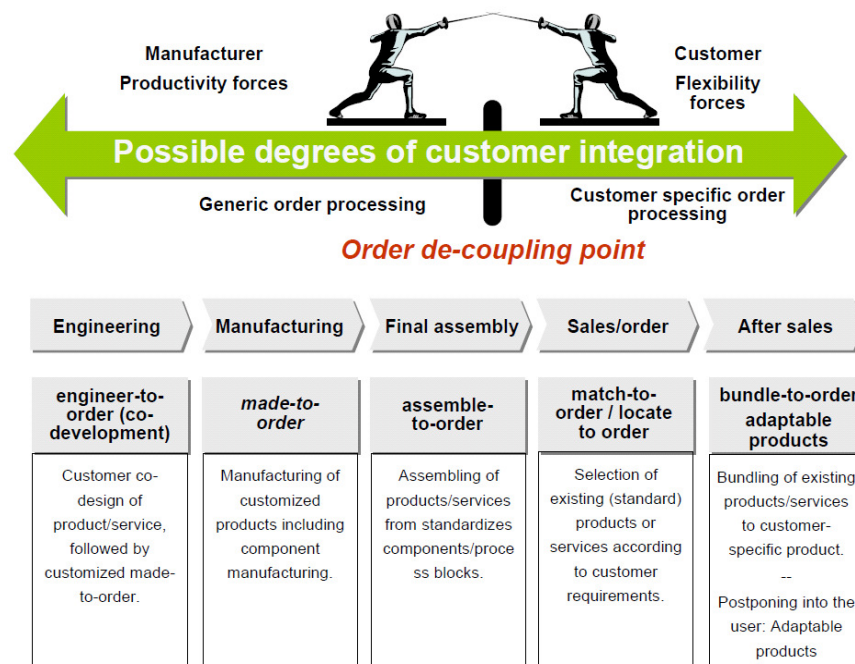


Figure 18: Postponement strategy and order de-coupling point (Lüthje, Lettl, & Piller, 2009)

2.3.4. Applying Mass Customization

Management literature suggests that ‘mass customization is not some exotic approach with limited application. Instead, it is a strategic mechanism that is applicable to most businesses, provided that it is appropriately understood and deployed. The key is to view it basically as a process for aligning an organization with its customers’ needs’ (Salvador, Martin, de Holan, & Piller, 2009, S. 71).

This aligning process is described as the development of three fundamental capabilities (see also Figure 19):

- (1) the ability to identify the product attributes along which customer needs diverge (*Solution Space Development*),
- (2) the ability to reuse or recombine existing organizational and value-chain resources (*Robust Process Design*), and
- (3) the ability to help customers identify or build solutions to their own needs (*Choice Navigation Support*).

And applying mass customization means to tailor these capabilities for the specific need of the business.

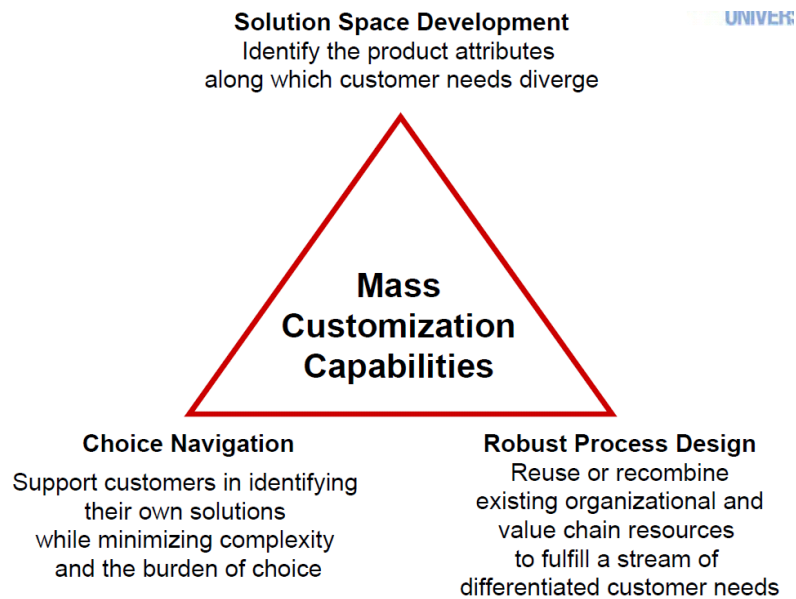


Figure 19: Capabilities for Mass Customization (Salvador, Martin, de Holan, & Piller, 2009)

The link with strategic approaches to analyze market opportunities is that mass customization needs to take into account industry or company specific factors described in chapter 2.1. 'But through our research, we have identified three common capabilities that will determine the fundamental ability of a company to mass-customize its offerings' (Salvador, Martin, de Holan, & Piller, 2009, S. 72).

Tools for Solution Space Development

Mass producers focus on serving common needs that are shared by almost all customers, while craftsman serve individual needs of one customer. Mass customizers have to identify those needs which are decisive for customer choice. And have to translate it into product or service attributes that will be offered, and those that will not be offered. This offer of choices is called a "Solution Space", and is created by linking customer needs with product or service attributes through different tools (Salvador, Martin, de Holan, & Piller, 2009):

Innovation Tool Kits: Software that enables large pools of customers to translate their preferences into unique product variants, allowing each customer to highlight possibly unsatisfied needs.

Virtual Concept Testing: An approach for efficiently submitting scores of differentiated product concepts to prospective customers via virtual prototype creation and evaluation.

Customer Experience Intelligence: A tool for continuously collecting data on customer transactions, behaviors or experiences and analyzing that information to determine customer preferences.

Tools for a Robust Process Design

Costs of introducing mass customization will depend on how significantly the existing operation and supply chain has to change. Near mass-production efficiency can only be reached if design is chosen that enables use or combination of existing capabilities and value-chain resources.

Achieving a robust product design, there are a number of tools available (Salvador, Martin, de Holan, & Piller, 2009):

Flexible Automation: Automation that is not fixed or rigid and can handle the customization of tangible or intangible goods.

Process Modularity: Segmenting existing organizational and value-chain resources into modules that can be reused or recombined to fulfill differentiated customers' needs.

Adaptive Human Capital: Developing managers and employees who can deal with new and ambiguous tasks.

Tools for Choice Navigation Support

Multiple options bring about a burden of choice for the customer. A mass customizer tries to minimize this burden by minimizing the complexity of choice. The goal is to overcome the "paradox of choice" and reach mass customization and not "mass confusion" of customers. Too many options can reduce the value for customers and might classify the product or service as difficult and undesirable (Huffman & Kahn, 1998), (Franke & Piller, 2004). Choice navigation tools try to simplify the choice for the customer (Salvador, Martin, de Holan, & Piller, 2009):

Assortment Matching: Software that matches the characteristics of an existing solutions space (that is, a set of options) with a model of the customer's needs and then makes product recommendations.

Fast-Cycle, Trial-and-Error Learning: An approach that empowers customers to build models of their needs and interactively test the match between those models and the available solutions.

Embedded Configuration: Products that "understand" how they should adapt to the customer and then reconfigure themselves accordingly.

The Mass Production – Mass Customization – Craftsman Continuum

In practice, there is no such thing as complete mass customization. The charm of the three capabilities described above is that they can be tackled one-by-one. It might even be helpful to see mass customization as a process of aligning the business closer to customer needs without losing the benefits of mass production and craftsmanship. Monitoring progress along Figure 20 symbolizes this continuous task.

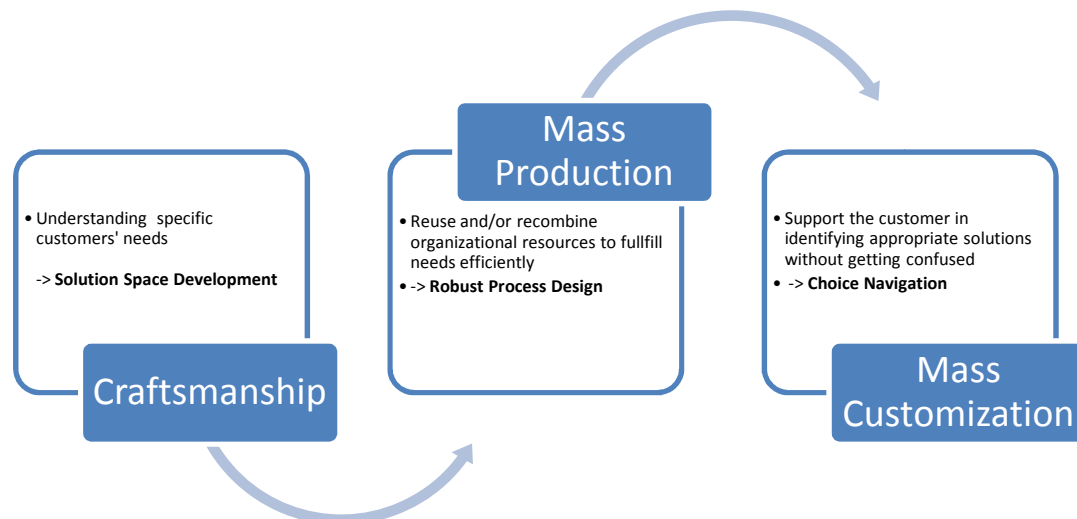


Figure 20: Development View of Mass Customization, adapted from (Salvador, Martin, de Holan, & Piller, 2009)

2.4. CONFIGURATORS AND THEIR POTENTIAL FOR CUSTOMIZATION

On a very pragmatic and concrete level, finding an accurate representation of customer needs is one of the key challenges in customization. Configurators are (IT) tools that might play an important part in identifying and overcoming the customization challenge for the Austrian Greenhouse Gas Inventory.

Configurators are synonymous with tools that help in representing the solution space and thus help in problem solving by giving feedback on a trial-and-error basis. This chapter looks at the definition (chapter 2.4.1) and the categories and design of Configurators (chapter 2.4.2) as a basis for practical recommendations in chapter 4.

2.4.1. Definitions

There is no commonly accepted definition of Configurators. But generally, a configurator is 'a software application for designing products exactly matching customers' individual needs' (CyLedge, 2009). Management literature includes the following definitions, as taken from (CyLedge, 2009):

- *A product configurator is a tool which supports the product configuration process so that all the design and configuration rules which are expressed in a*

product configuration model are guaranteed to be satisfied (Hedin, Ohlsson, & McKenna, 1998)

- “Product Configurators” used by producers of mass-customized products are similar in intent but less capable than toolkits for User Innovation and Design. They invite product purchasers to configure their own unique product by selecting from lists of options that have been predesigned by the mass customizer. For example, Dell Computer invites visitors to its website to “design your own computer” by making choices among lists of computer components on offer, such as monitors and disk drives (van Hippel & Katz, 2002)

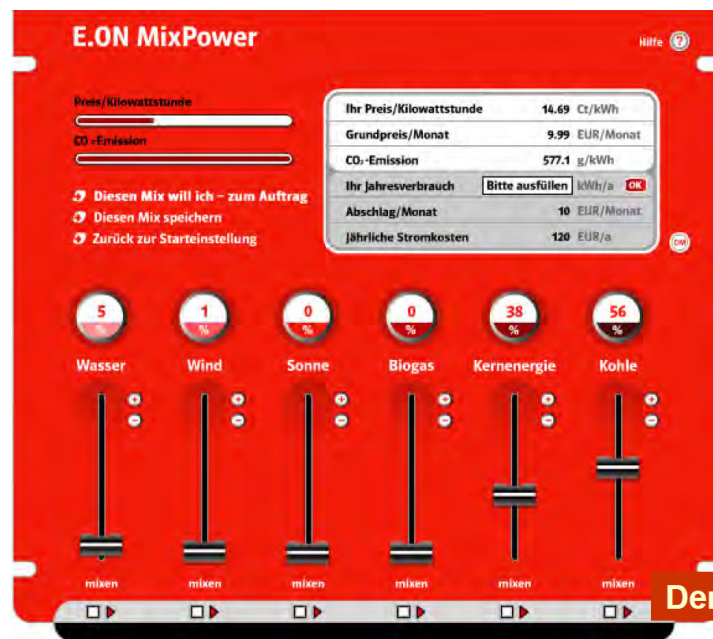


Figure 21: Configurator example, taken from (Lüthje, Lettl, & Piller, 2009)

- Known as Configurators, choice boards, design systems, toolkits, or co-design platforms, these systems are responsible for guiding the user through the configuration process. Different variations are represented, visualized, assessed and priced which starts a learning-by-doing process for the user. While the term “configurator” or “configuration system” is quoted rather often in literature, it is used for the most part in a technical sense addressing a software tool. The success of such an interaction system is, however, by no means not only defined by its technological capabilities, but also by its integration in the whole sale environment, its ability to allow for learning by doing, to provide experience and process satisfaction, and its integration into the brand concept (Franke & Piller, 2003)
- A product configurator has been an effective software tool in successful implementation of mass customization strategy. It enables manufacturers to automatically generate product configuration information tailored to individual customers' needs (Xie, Henderson, & Kernahan, 2005)

Configurators differ widely and are used in different forms and industries. They are used in B2B as well as in B2C markets and are operated either by trained staff or customers themselves. 'Whereas B2B Configurators are primarily used to support sales and lift production efficiency, B2C Configurators are often employed as design tools that allow customers to "co-design" their own products (CyLedge, 2009)'.

2.4.2. Categories and Design of Configurators

Management literature distinguishes configurator categories following company requirements and customers use. It is mostly a software choice.

'The configurator market can appear confusing. Unlike financial accounting software, which has specific functionality for categories such as accounts receivables, payables, and a general ledger, there are no such standard definitions of what configuration software must contain. All Configurators are not the same, and today there are hundreds of different software products that fall under the umbrella term of "configurator" or "product configurator"' (ConfigureOne, 2009, S. 1). The four major categories are:

Knowledge-based engineering (KBE) solutions: KBEs are typically a tool for engineers.

They are used by companies that design large complex equipment, which needs an experienced engineer through the whole design process.

Enterprise Resource Planning (ERP) configurator modules: Typically used by internal customer service – and functionally closely linked with the resource planning system in some way.

Product visualization solutions: Typically used by customers. They visualize the end product that has been configured by the customer (see e.g. Figure 21).

Enterprise product Configurators: Ambition to be used by the company as well as by the customer. Usually, web-based and flexible enough to be used internally and externally.

Specifications for a configurator need to taken into account the different demands for a specific business.

The main aspects can be seen from a company perspective as:

- Extent to which the supply chain should be covered
- Link with suppliers
- Inclusion of (all) customer data
- Integration with existing ERP and CRM systems
- Software maintenance

- Emotional connection with customer
 - Link with dealers;
 - Usability for other purchases
 - Availability of all relevant information – online help
 - Follow-up possibilities (after purchase)
 - Legal soundness on a national level
 - Up-to date to current offers
 - Privacy
- and from a customer perspective as:
- Visualization
 - Fit to knowledge
 - Easy to use, easy to navigate
 - Fault free
 - Safe personal settings to come back to

Addressing these aspects, a configurator system has to be customized as well. Possible structural parameters are given in Figure 22.


Sales channel	Web-based	Offline (Customer is not connected via internet to the manufacturer)		Hybrid
User	End-customer	Dealer	Salesman	
Degree of possible customization	low 		high	
Collection of information for customization	Graphical		Text based	
			Check box list	Question-Answer
Consultation	Without consultation		With consultation	
Market focus	Business-to-Consumer	Business-to-Business	Hybrid	

Figure 22: How to structure configuration systems, (Wiedemann, *Die Nutzung von Mass Customization-Konfiguratoren*, 2003)

Other relevant research on the design of toolkits for customer co-design is summarized as follows:

- Problem solving process, trial-and-error learning (Marples 1961; Allen 1966; von Hippel / Tyre 1995)
- Design of configurators
 - Experimentation (Thomke 2003; Thomke/von Hippel 2002)
 - Need-based versus parameter-based configuration (Dellaert & Stremersch 2005; Randall, Terwiesch & Ulrich 2005, 2006)
 - Subtractive versus additive option-framing (Park et al. 2000; Levin et al. 2002)
 - Value of integration with additional planning and control systems along the supply chain
 - Value of integration with product architecture planning ("design for mass customization") (Havm et al. 2005)

3. EMPIRICAL PART

APPLYING SELECTED APPROACHES TO IDENTIFY CUSTOMIZATION

CHALLENGES FOR UMWELTBUNDESAMT'S AUSTRIAN GREENHOUSE GAS INVENTORY

The previous chapter selected methods that help in identifying and overcoming customization challenges peculiar to the specific situation of the Austrian Greenhouse Gas Inventory. As outlined in the introduction to chapter two, this specific situation is characterized (1) by the non-profit context, (2) the one-costumer focus, and (3) by an already well established product design of the Inventory.

This chapter introduces Umweltbundesamt and the department on Emissions & Climate Change as the context of the Inventory and then applies the selected approaches from chapter two to identify the main customization challenges. After analyzing Umweltbundesamt's present situation with regard to strategy and customization it performs a strategic analysis of market opportunities and an assessment of customer behavior and the applicability of the principles of mass customization.

Not all of the tools and theoretical concepts mentioned in chapter 2 are applied in-depth in this chapter since this would go beyond the scope of this master thesis. They are nevertheless presented to give options for further investigations on the customization challenges for Umweltbundesamt – and are therefore at least cursory mentioned in this chapter.

The selection criteria for the focus in this chapter has, on the one hand, been on concepts and tools that focus on identifying challenges between (non-profit) strategy and customization. And on the other hand, on tools that can pragmatically be applied to result in specification of a Configurator for the Austrian Greenhouse Gas Inventory.

3.1. STRATEGIC ANALYSIS OF MARKET OPPORTUNITIES FOR THE AUSTRIAN GREENHOUSE GAS INVENTORY

3.1.1. Introduction

The Austrian Greenhouse Gas Inventory is prepared by Umweltbundesamt, the Austrian Environment Agency, as part of its responsibilities laid-out in the Environmental Control Act (see annex 1).

This introductory chapter outlines the history, mission, and main strategic lines of Umweltbundesamt, followed by an overview on the department of Emissions & Climate Change, the organizational unit responsible for the preparation of the Austrian Greenhouse Gas Inventory.

Umweltbundesamt

Umweltbundesamt was founded in 1984 to support the Austrian Government on all technical and political issues related to environmental protection. In 1999, after years as an administrative part of the Environment Ministry, Umweltbundesamt was outsourced by a revision of the Environmental Control Act - conferring with it the status of a company with limited liability (GmbH). It is now still 100% state-owned with six members on the board of directors (2 Environment Ministry, 2 Finance Ministry, 2 Workers Council) and a CEO appointed for five years.

The new status as a company has been accompanied by considerable economic success. The number of employees has grown from about 200 in 1999 to about 450 in 2009. At the same time, the turn-over has almost doubled to €40m in 2008. This in spite of the fact that the annual state budget has been fixed nominally, i.e. is a yearly subsidy specified in the Environmental Control Act that does not increase over time.

There were two major organizational restructuring in 2000 and 2007 which set-up HR, Controlling, and Communications departments and four programmes that have line responsibility for about 25 departments dealing with specific environmental control for air, water, and soil. It also includes laboratories and IT support. Other important organizational changes include the setting-up of a department on Corporate Strategy and on Organizational Development in 2007 and 2010 respectively.

Umweltbundesamt's Mission Statement

It is Umweltbundesamt's vision to find pathways to sustainable growth in an open dialogue with main political and economical players in Austria and elsewhere (Kienzl, Vision und Leitbild, 2009).

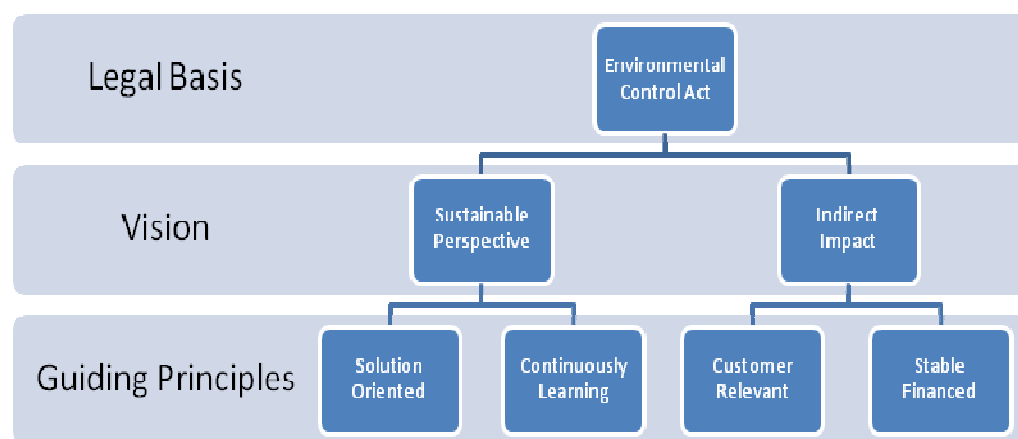


Figure 23: Umweltbundesamt's Mission, summary by the author, November 2009

Umweltbundesamt's mission is, on the one hand, to provide the society with perspectives for sustainable development and on the other hand, to protect the environment through Umweltbundesamt's indirect impact on customers. The mission

statement, which is currently under development (see Figure 23), is supplemented by guiding principles that try to define and safeguard our specific corporate culture.

Umweltbundesamt's Corporate Culture

Umweltbundesamt's corporate and management culture has considerably changed over recent years. It started out as a state institute and is now step-by-step trying to find its own way of becoming a professional agency that takes an active role in managing its financial basis. In 2009, the implementation of a process that aims at improving (intensify and broaden) customer relations ('Öffnungsprozess'), has been started.

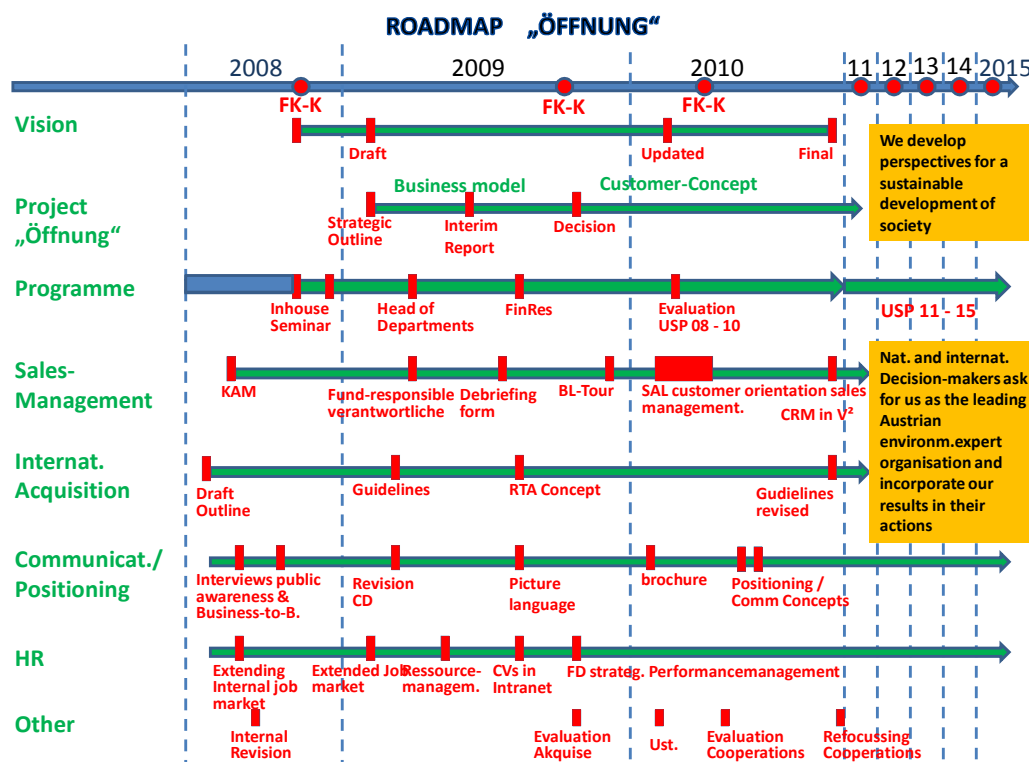


Figure 24: Roadmap “Öffnung”, (Kienzl, Roadmap Öffnung, 2009)

The “opening” is an overarching process that aligns a number of strategic processes with each other and to the overall mission of Umweltbundesamt (see Figure 24). The final aim, of this major strategic effort, is to be a leading organization in Austria that develops sustainable perspectives for the society and decisively influence key players of environmental protection in Austria and the European Union. These key players will contract Umweltbundesamt and thus ensure a sound financial basis for the organization.

“Öffnung” as the main strategic initiative of Umweltbundesamt

The two main aims of the process “Öffnung” are to ensure stable funding and to increase the relevance of Umweltbundesamt's contributions to environmental protection (Rebernig & et.al., 2009). The strategy-accompanying project on “Geschäftsmodelle für

die Umweltbundesamt-Öffnung” develops specific business models that support different services areas of Umweltbundesamt (phase 1) and later on defines basic conditions for implementing these business models (phase 2).

The “Öffnungs” framework defines that Umweltbundesamt will remain a non-profit organization, but that ‘founding a profit-oriented subsidiary-company could be part of a follow-up project’ (Rebernig & et.al., 2009). It moreover defines target values for turn-over in 2015 and specifies conditions on core service, support areas, marketing strategy, and organization – as summarized here:

- The target for the public domain is to quadruple the income from other sections within the environment ministry, other ministries and federal governments, while being prepared to loose up-to a third of current customer’s budget, i.e. sections V-VII of the ministry of the environment (all by 2015).
- The target for income from international customers and consulting is to almost double revenue from customers such as the European Commission and to aim for a substantial increase from consulting to big firms in Austria – both by 2015.
- Core services are defined as (1) policy support in environmental protection, (2) assistance in implementation, and (3) one-stop-shop solutions for environmental related support-tasks.
- Two business models are proposed: One to support areas for *bilateral support* to customers in the public domain where Umweltbundesamt will be visible mainly through the customers themselves; and another that *supports stakeholder processes* where Umweltbundesamt will be visible as a “equidistant” player working for the state (on state budget) or for a number of other customers.
- The framework is given for the marketing strategy. It positions Umweltbundesamt as an “equidistant” service provider for all stakeholders in environmental protection. This is to be achieved by efforts in refining the image of Umweltbundesamt as being ‘more than a work bench’ for the environment ministry.
- It also stresses deepening the current market and getting access to new markets for existing products and services. And it defines customer benefits for public customers (easy contracting, no VAT, privileged information access and a clear separation from other customers) and encourages the use of a networks approach to break-out of the ‘logic of bilateral working relationships’.
- The framework acknowledges that organizational and employee capabilities have to be developed in order to work with networks but reassures that the organizational structure will fundamentally remain the same.
- The framework paper foresees moderate growth of staff by 2015 with a focus on improving competency *within* the firm and a well defined interface between the project “Öffnung” and other line organization processes.

The Department on Emissions & Climate Change

The project for preparing the Austrian Greenhouse Gas Inventory is led by the Department on Emissions & Climate Change. The department consists of 19 people that

work on a number of issues connected with environmental control in the area of emissions to air and the mitigation of climate change. All work is organized within about 30 projects that themselves can be linked to four portfolios, which name the main content these projects have in common (see Figure 25).

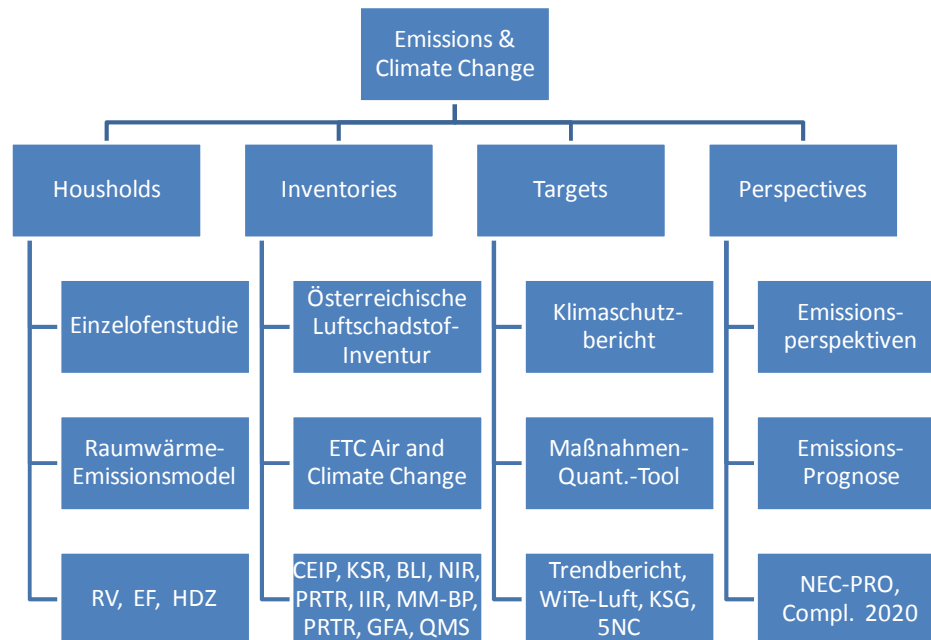


Figure 25: Projects and Portfolios, Department on “Emissions & Climate Change”, 2009

These projects vary considerably in the number of people involved, the type of funding, the budget size, the environmental impact, and the innovativeness. But all of them have a clearly defined customer and make a specific contribution to environmental control in Austria.

The challenge for Umweltbundesamt and the Department on Emissions & Climate Change is to optimize the environmental impact of these projects while taking active care of managing the financial budgets needed for this work.

The Department’s budget comes from four main sources (see Figure 26). The by-far biggest comes directly from the state. This “state budget” is part of a fixed amount of 15.35 Million Euros that Umweltbundesamt receives yearly as defined in the Environmental Control Act. These 15.35 Million are then apportioned out to the different departments as part of the annual work plan process.

Another important source of income is additional funding received directly from the Environment Ministry or other public agencies that can represent the Austrian Government. They have the possibility to let Umweltbundesamt carry-out additional tasks, provided that they finance it through additional funding that at least covers the total operating expenses of Umweltbundesamt.

The two remaining sources of funding are grants, mainly from the European Commission and the Austrian “Bundesländer”, and contract funding, again mainly from tendering for projects of the European Commission.

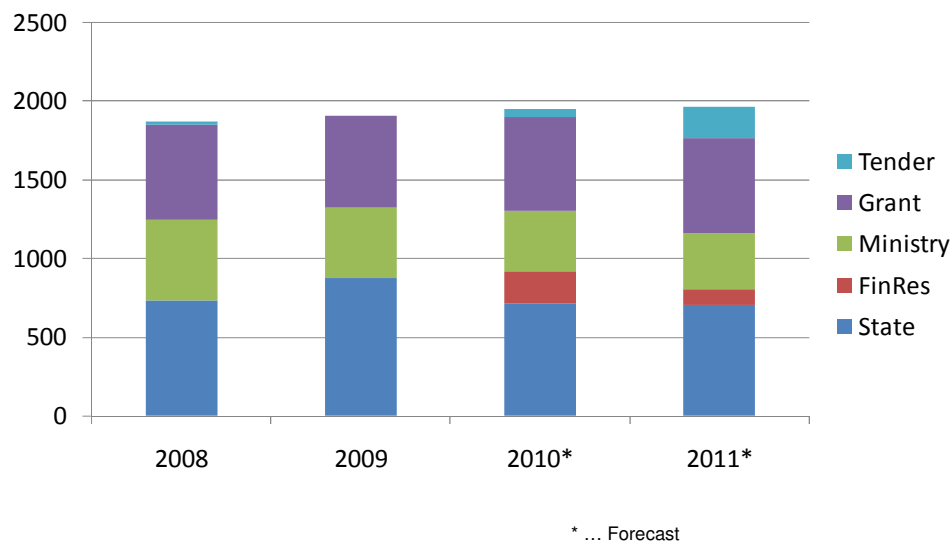


Figure 26: Budgets 2008-2011 in €1000, Department on “Emissions & Climate Change, November 2009

In the foreseeable future, it is expected that the state budget share for the department will be decreasing. This is due to the fact that Umweltbundesamt’s overhead will be increasing, e.g. through additional staff in central functions like controlling or marketing, and less budget will therefore be available to be distributed to the departments in Umweltbundesamt.

A notable exception for the department is the year 2010. Umweltbundesamt as a whole reserved 10% of state budget for innovative projects (FinRes). The Department on Emissions & Climate Change has won two projects to be funded through FinRes (see years 2010 and 2011 in Figure 26).

The financial and budgeting challenge for the department is to free resources within the department through efficient exploitation of existing capabilities in order to be able to claim additional funding through grants and tenders. The innovation strategy for the department has to take into account Umweltbundesamt’s overall strategy and principle/restrictions within which the department and Umweltbundesamt operate.

The Austrian Greenhouse Gas Inventory

Austria, as a Party to the United Nations Framework Convention on Climate Change, and the Kyoto Protocol, is required to produce and annually update a national greenhouse gas inventory. This inventory has to comply with a number of specific guidelines and is subject to annual reviews by an international expert review team selected by the United

Nations. The six people of the expert review team assesses each year for a week if the inventory is prepared in a way as to be transparent, comparable, complete, consistent, and precise.

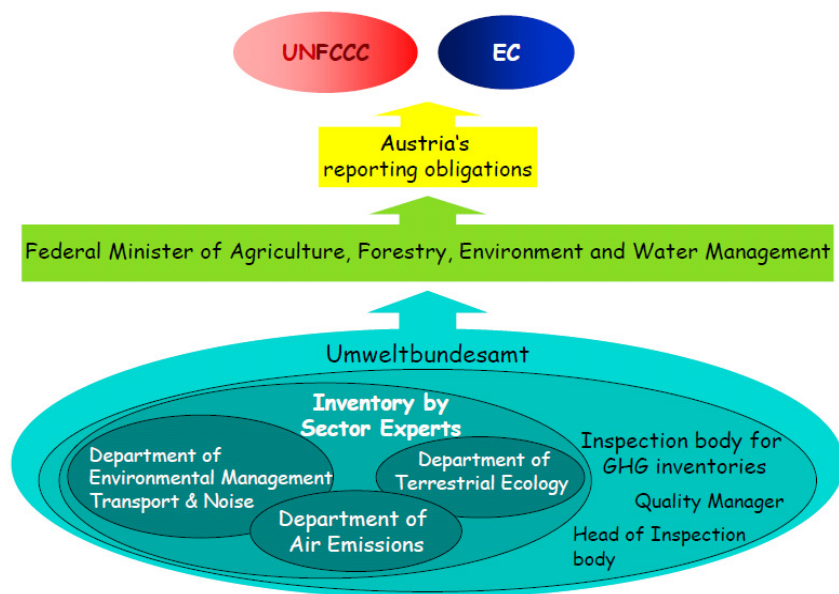


Figure 27: Responsibilities in the Austrian National System for Greenhouse Gas Inventories, (Anderl, et al., 2009)

Umweltbundesamt is by law the single national entity with overall responsibility for the national inventory. ‘The responsibilities for the inventory planning, preparation and management are specified and are all allocated within the Umweltbundesamt’ (Muik & Wieser, 2005, S. 5). The overall responsibility for all work related to the preparation of the inventory is the Department on Emissions & Climate Change’s.

In support of the preparation process for the Greenhouse Gas Inventory, Umweltbundesamt is ISO 17020 accredited as inspection body for inventory preparation. This quality management system includes the necessary procedures to ensure quality improvement of the emission inventory, including documentation and responsibility of resolving findings by UNFCCC expert review team.

Main data sources for the inventory preparation are the energy statistics, reports by operators, and emission factors derived from literature or measurements.

‘Responsibilities are divided by sectors between sector experts from Departments within the Umweltbundesamt (Figure 27). The “Inspection body for the GHG inventory” within the Umweltbundesamt is responsible for the compilation of the greenhouse gas inventory. The quality system is maintained and updated under the responsibility of the Quality Manager. The quality manager has direct access to the top management’ (Anderl, et al., 2009).

3.1.2. Industry Analysis

Up to 1998, Umweltbundesamt and the Austrian Greenhouse Gas Inventory operated within the comparatively stable environment of being an administrative unit of the Austrian Ministry for the Environment. With establishing Umweltbundesamt as a company with limited liability (GmbH) in 1999, the area of competition widened considerably and now covers the area of product- and service-providers related to environmental protection.

This chapter uses the framework of Porter's Five Forces of Competition to classify and analyze the intensity of competition the Greenhouse Gas Inventory has to face.

The Power of Suppliers

Statistics Austria is one of the main data suppliers for the Austrian Greenhouse Gas Inventory. The energy statistics, in particular, is crucial for preparing annual updates of emission estimates. But there are also other statistics like the agricultural animal counts and import/export statistics on solvents.

All of these statistics are publicly funded with no exclusivity for the Austrian Greenhouse Gas Inventory as a customer. Some are initiated and defined long-term by law, like the export/import statistics; whereas others are funded by Ministries through annual contracts, like the energy statistics.

Another source of suppliers is reports by companies, through for example the European Emission Trading System (ETS), which are defined by law. And then there are direct requests from Umweltbundesamt to operators of emission producing companies that are answered voluntarily.

Some parts of the inventory are contracted out to institutes that perform certain tasks where there is not enough know how in-house, like the transport emissions calculated by the technical university in Graz.

The Austrian Greenhouse Gas Inventory is supplied by a number of sources, but most of them are, directly or indirectly, in the public domain. Their negotiation power is rather strong, as their costs are not covered by Umweltbundesamt directly. They, at least, need to see the overall benefit of any request made to be willing to increase their work load.

Recent policy developments aim at establishing a Climate Mitigation Law (Klimaschutzgesetz), which devolves responsibility for emission targets to political bodies responsible for mitigation within Austria. This would decrease the negotiation power of suppliers, as the political bodies would have an interest to improve the quality of data delivery and thus support Umweltbundesamt in ensuring financing and timely delivery of supplier data.

The Availability of Substitute Products or Services

There is no direct substitute for the Austrian Greenhouse Gas Inventory as there are international legal requirements and Umweltbundesamt's responsibility is set by law. But seen as a collection of environmental information that is "official" and easily accessible, there is competition from all who supply environmental information.

In this sense, the assumption is that most potential customers at the moment use available substitute products or services. These customers are (1) firms that are interested in their environmental performance, (2) consultants that need this information for the services offered, (3) University Institutes that offer assessments, (4) local governments that have to check progress in environmental performance, and (5) NGOs that are interested in compliance checking.

They request data directly from Umweltbundesamt or use an environmental consultant to gather all relevant information needed for their own environmental accounting. This assumes a high availability of substitute products and services in particular through consultants like Denkstatt, one of the main environmental consultants in Austria whose business has significantly increased of recent years (Zotter, 2009).

The underlying assumption for this thesis is, that firms pay a considerable amount of money for substitute products or services that collate external environmental information together with internal environmental information to form a basis for decision making at executive level.

Threats Posed by New Entrants

As the inventory's core role is defined by law, new entrants could only appear through a change in the Environmental Control Act. This would only happen if serious problems with the end-product would lead to a re-thinking on a political level. Only if Umweltbundesamt is no longer seen as capable of performing the inventory would a new entrant be possible.

However, if the inventory is seen in its role as a data provider, there are a number of new entrants in Austria for the non-core business of the greenhouse gas inventory. Worldwide discussions on climate change and the role countries and specific companies play in reaching targets have led to an increase in demand for start-up companies and established consultants to offer environmental services.

New entrants from the established consultancy side can offer stronger product differentiation, like a specifically customized service to a company, and stronger customer loyalty through previous working experience. They can also profit from economies of scale since their environmental business is only a part of their overall consultancy business. And as such they have, for example access to well-established distribution channels.

There are also a number of newly founded consultancies that focus directly on support to business in producing greenhouse gas inventories. The demand is mainly from

companies that are part of the European Emission Trading System (ETS) or from companies that are under market pressure to improve their environmental performance and show it through greenhouse gas accounting tools like the “Carbon Footprints”.

These start-up companies are competitive through highly customized products and services that they offer and an entrepreneurial spirit where the charisma of the CEO plays an important part in reaching new markets.

Buyers Negotiation Power

The formal “buyer” for the inventory is the Ministry of the Environment for the United Nations’ Framework Convention on Climate Change, which sets the rules to which the inventory has to comply. These rules are defined by the Parties to the Convention, i.e. a body representing National Governments. Those governments have all the information available about the product and in the end, through their guidelines, define differentiation and cost of the inventory.

The inventory as core product is funded by the state. This buyer is represented by the Ministry of the Environment and has a strong negotiation power since it can define the quality of the products through the international process as well as influencing the work programme of Umweltbundesamt through the board of directors.

Other customers will only be willing to pay for the additional customization performed that improves the usability. As such, the cost of the product or service to the customer is small in comparison to the overall costs.

On the other hand, all the information is in the end publicly available, giving the buyer the choice to use any other source to get the service wanted. This gives buyers a strong position in asking exactly for the kind of customization needed for their business purposes.

Competitive Rivalry, Corporate Foresight, and Key Success Factors

There is minimal competition for the core product of the Austrian Greenhouse Gas Inventory. There is however considerable rivalry in the market for supplying customized environmental information related to greenhouse gas emissions. Well established consultancy firms have a strong hold on business sectors since they have supplied related management services for a number of years. Other semi-public organisations like the Austrian Energy Agency or WIFO face budget restrictions and therefore increasingly offer services that are related to climate change and thus increase competitive rivalry.

Market size is expected to grow in the future and with it the number and power of competitors. More and more companies, institutes and NGOs will be interested to prepare, improve, and check carbon balances. The creditability will become more important and the official status of the information and its service provider might become crucial for the use in the customers’ public relations.

Customers want environmental information customized for their own very specific purpose. They want to trust in the numbers and be prepared for any attacks on the credibility of the information used. They are price sensitive since they know that the information is in principle in the public domain – but they are willing to pay a premium for customization. They mainly choose on credibility and customizability, and to a lesser extent on costs.

Key success factors (for selling environmental information related to the Greenhouse Gas Inventory) are therefore uncontested credibility and a superior ability to customize the environmental information to the specific needs of customers without incurring excessive costs.

3.1.3. *Company Analysis*

This chapter looks at key resources and capabilities of the Austrian Greenhouse Gas Inventory. Based on the key success factors from above, the question to address here is to identify the specific resources and capabilities within Umweltbundesamt that these factors are based on.

The credibility for the core business of the inventory is based on the international recognition of the quality of the Austrian Greenhouse Gas Inventory. And this is related to the performance of the inventory in the yearly reviews by the expert review teams of the UN. Customization is based on the ability to recognize customer wishes and on the technical capability to take these into account.

This chapter performs a short value chain & VRIO analysis and considers aspects of technology-push and knowledge management.

Value Chain Analysis, Technology-Push, and Knowledge Management

The *technology* underpinning the Austrian Greenhouse Gas Inventory is based on the expert know-how of a team that is specialized for specific economic sectors. They usually use their background within a certain field of expertise and then apply or adapt the methodology defined by international guidelines to calculate emissions.

The status of the technology development is mature since the existing team has been producing inventories, with approved quality, for several years now. The technology as such cannot be patented but includes a number of unique product process decisions that are specific for Austria.

The key strength of the *product design* is the close fit to the international requirements. But this is also a key weakness as the product design up-to now only fulfils these requirements and none more.

The key strength of the *production* of the inventory is its compliance with ISO 17020 quality handbook and a well structured process involving sectoral preparation of estimates and the collation to a central data system where quality checks are performed and the final product is assembled. Almost all parts are prepared within

Umweltbundesamt, involving experts from three different departments. Some parts are outsourced – with procurement done along the specifications of the quality management system. The key weakness is the inflexibility of the production design that is currently only geared towards fulfilling the core customers' needs.

The key strength of *marketing* and *distribution* is the active advertising and electronical distribution of our inventory through press releases as part of the yearly compliance assessment of the government. The key weakness is that other benefits or uses of the inventory are not yet advertised.

The key strength of *after-sales service* is the promptness with which demands by the expert review team are being dealt with. The key weakness is a yet non-existing service for other customers.

Many of these strengths are VRIO (valuable, rare, difficult to imitate, and output-oriented). But the key capability is our team of experts in-house that links international requirements with their sector specific expertise and comes up with reliable estimates that confirm its status as one of the best inventories world-wide.

Two side remarks on the concept of the *technology-push* and *knowledge management*: The customization of the Austrian Greenhouse Gas Inventory is one way of finding new market applications in an area where the technology is to now not used. The question here is what other markets there are and where the key capability, i.e. of sector know-how linked with international reporting, can best be applied to.

It is also rather clear that this is a process of exploitation, i.e. a process that is applying knowledge held by the organisation. Almost all of this know-how is tacit in nature. QMS is a first step in making it explicit, i.e. to knowledge held by the organization.

Marketing and Innovation Perspective

It is not part of this thesis to develop a marketing strategy for the Austrian Greenhouse Gas Inventory. Nevertheless, it seems pertinent to ask the main question underlying marketing decisions here, that is the question about "What business are we in?" (see chapter 2.2.2).

The answer to that would be (at this point of time – before the market / customer analysis): *"The inventory is in the business of supplying environmental information needed in fulfilling the international reporting requirements for the Kyoto Protocol and in the business of ensuring that this information can be customized in a way that adds value to other customers"*.

Technology and Innovation Perspective

Customizing the Austrian Greenhouse Gas Inventory can be characterized as a significant product improvement, but the aim will be that the underlying technology

hardly changes in order to minimize costs. It can therefore be characterized as an incremental innovation that will not completely change the current production design.

The risk of overlooking something that completely changes the rules of the game seems small since the inventory and its production design very much follow international specifications that won't change overnight. It will, in the language of technology, remain a dominant design for quite some time. Though political development in the Kyoto Protocol can lead to completely different compliance regimes, and only that would ultimately result in drastically changed inventories.

One of the tools that might be applied, to the latter mentioned drastic change in the inventory, is "technology roadmapping". This could help in forecasting and visualizing different roads inventory might take in the future – depending on the outcome of the different discussions that are at the moment taking place in the international negotiations to find a follow-up agreement to the Kyoto Protocol.

Applying the tool of *technological competence leveraging* is another tool that is used to find new market opportunities for the current product application. And the process of de-linking, that is of describing the potential of the inventory product in a language independent from the current use, has been included in the reasoning of the company analysis above. Re-linking this potential with new markets helps in identifying markets that best match the existing capability and that have not previously been thought of.

3.2. ASSESSMENT OF CUSTOMER BEHAVIOUR AND CUSTOMIZATION PROCESS

One of the main aims of customizing the inventory is to reach new customers and fulfil their needs, as it has already been argued in previous chapters that the Austrian Greenhouse Gas Inventory fulfils the needs of the current customers to quite some extent.

This chapter therefore takes a closer look at the needs of potentially new customers that might be interested and willing to pay for a customized version of the Austrian Greenhouse Gas Inventory.

3.2.1. Customer Needs

One of the underlying assumptions for this thesis is that customizing the Austrian Greenhouse Gas Inventory will add value to new customers. These customers would be willing to pay a premium for a customized version of the inventory as long as it is competitively priced. The main other assumption is that this can be done in a way that improves the overall performance of Umweltbundesamt in environmental control.

Performance Gap

Building on the strategic analysis in chapter 3.1 and the tools identified in chapter 1, the performance gap, i.e. the desired state could be described as follows:

“Get inventory data that is official and relevant to the situation of the customer:

- *at the moment they need it*
- *with complete confidence in the applicability and reliability of the data*
- *and pertinent to the national and international situation*
- *that follows international reporting standards*
- *and being able to get consistent data in the future with reduced search costs*
- *that helps in overall compliance checking*
- *and that has the potential to be extended to other data areas.”*

The customer perception of the current state is unknown for the potentially high number of customers. But interviews with one of Umweltbundesamt’s current key customers, the Environment Ministry, resulted in the following main success factors for Umweltbundesamt (Bürgel, Lamprecht, Ritter, Seuss, & Trimbacher, 2009, S. 5f):

- *ability to react quickly* to policy demands (minimal response time)
- *build strong personal trust* relations with the Ministry – between experts
- *ability to represent the Ministry on the same footing (“auf Augenhöhe”)* based on a *common interest*
- *ability to be easily contractible and flexibility in supplying resources* and staff beyond the administrative restrictions of the Ministry.

Other customer needs were only evaluated indirectly and focused on Ministries other than Environment and on the federal governments (“Bundesländer”). This was done through interviews with experts inside and outside Umweltbundesamt about what they thought about common needs and traits of these customers. The result shows a sketchy picture of the variety of potential customers and is summarized by the author here - based on (Bürgel, Lamprecht, Ritter, Seuss, & Trimbacher, 2009, S. 10f):

- *Interests differ widely* – and are also between different departments of one institution
- Their needs are significantly influenced by their existing working *relations with external* institutions
- There is a specific culture related to being public agencies that is characterized by *low internal coordination*, low flexibility in staff, and an unclear picture of their own demand

Key Roles in the Buying Process and the Forming of Attitudes

The buying process for a non-profit organisation can be complex since product users and persons paying for the product are usually not the same.

The main customer (buyer) of the Austrian Greenhouse Gas Inventory is the international community represented by the United Nations’ Expert Review Team (ERT) under the Kyoto Protocol. It is their demand that has to be fulfilled in the first place in order to comply with the basic product requirements.

This is the customer most related with defining the quality of the current product. The ERT is, however, not a customer in a sense of paying for the product. This is done by the Austrian tax payer through the work plan and the accompanying budget distribution at Umweltbundesamt. The work plan of Umweltbundesamt has to be approved by the board of directors, led by the Environment Ministry. The external customer that more or less pays for the inventory indirectly is therefore the Ministry of the Environment.

In contrast to the core business, the buying centre for potential future customers is simpler since the assumption is that the customer of an inventory pays directly for the customized product.

The attitude towards Umweltbundesamt though may be mostly defined by actual referral, i.e. being based on previous contacts with Umweltbundesamt. And this previous contact could well be in an environmental control context, where we have a specific role in indirect compliance checking. How this can be addressed will be one of the key challenges for the marketing concept.

3.2.2. Customization Process

The current customization process follows recommendations from the UN expert review team. These recommendations are included into the quality management of the inventory as part of the inventory improvement plan – and then implemented in following years.

This chapter therefore focuses on the customization process for potential future customers.

Market Segmentation

Based on the strategic analysis in chapter 3.1 and on the customer needs in chapter 3.2.1, potential future customers can be given as follows:

- public agencies tasked with compliance checking of climate policy
- management consultants preparing assessments for business customers
- environmental consultants
- institutes preparing environmental assessments
- environment experts at SMEs in Austria
- concerned citizens and NGOs

Segmentation based on differentiated benefits results in:

- *The Compliance Segment:* Authoritative compliance checking. Public agencies like federal governments or other ministries have to check if they are still on track to reach certain environmental targets. This is a need that might be shared by concerned citizens. They want to check if targets are being reached.
- *The Fast-Access Segment:* Fast access to applicable and pertinent environmental information. Consultants need fast and specific access to

information that they can relate to services that they perform for customers. The same holds true for other institutes preparing environmental assessment, like the Austrian Energy Institute or WIFO.

- *The Benchmark Segment:* Supplying benchmark indicators usable for public relations. Businesses in Austria want to relate their own environmental performance within their industry, nationally and Europe-wide.

Target Market Selection

Which of these three market segments offers the highest return on investment? Based on the competitive environment and the capabilities of the company, Umweltbundesamt's capability is strongest in designing and producing rather than in marketing or finance.

This is leading to the conclusion that Umweltbundesamt will be the strongest player in the compliance segment since it is here where we can bring in our capabilities in producing authoritative information about distance to targets.

Although the number of potential customers is limited, establishing a firm market in this segment might lead to a stronger willingness to buy in the fast-access and the benchmark segment.

Positioning

The unique selling proposition of a customized inventory is the *authoritative* compliance checking. The authoritative aspect of the compliance check is the main driver for public agencies in the target segment to buy and might also attract customers from the other two segments.

The related positioning statement could be captured in statements such as: "*Adding Value to Environmental Control through a Customized Access to the Austrian Greenhouse Gas Inventory*" or more specifically "*The Authoritative Tool for Customized Compliance Checking in Climate Change Mitigation*".

These initial thoughts on the positioning statement can be used as a starting point for a marketing strategy. The core of it is that there is a modern kind of environmental control that adds value through an improvement of the usability of the data for a wide range of customers. It uses up-to-date electronic tools to address the specific needs of all who want to have authoritative data in compliance checking. The underlying assumption being, that the more customers use authoritative environmental control data, the less discussions are on the validity of data – and the more resources are available for actions combating climate change.

3.2.3. Customization and New Product Development

Customizing the Austrian Greenhouse Gas Inventory can be seen as a *new product development* since this refers to a product that still has to be designed and brought to market.

It is therefore the question of when and where best to involve the customer in the development process. The idea for the customization and the concept have to be based on comprehensive know-how about the wishes of customers, i.e. “need information”, if the new products are to be successful on the market. But it is not easy to get this information in particular in a target market that has an unclear picture of its own needs and is strongly influenced by unpredictable policy demands (see chapter 3.2.1).

The customization of the Austrian Greenhouse Gas Inventory can be characterized as a behaviour where the sender of the information (the customer) lacks the ability to provide the information needed. The principle to be applied here to overcome the “stickiness” of the information is to observe, rather than ask – since the customer can’t answer the question.

The user involvement is therefore rather in the stages of the detailed design and in the prototyping stage and less so in the stages of specification and concept development. The approach used is a “design for” or a “design with” the customer and could be characterized as user-oriented product development.

Emphatic design may play a role through involvement of selected customers that are observed in the later stage of the product, i.e. when they use prototypes.

3.3. MASS CUSTOMIZATION AND THE AUSTRIAN GREENHOUSE GAS INVENTORY

On first sight, mass customization is not a concept that seems to fit well with the production of the Austrian Greenhouse Gas Inventory.

But in seeing mass customization as a process of providing (additional) value to individual customers without adding unnecessary cost and complexity to the firm, it is much more apparent why this could be the approach of choice in customizing the inventory. The current production process can thus be seen as a kind of mass production, where a lot has been done in recent years to improve efficiency. All efforts were targeted towards optimizing the product for its core “mass” market, i.e. the demands of the Ministry of the Environment.

The aim of the customization process is to open the product to new customers without losing current characteristics of the production design that bring about low production costs. The key here is not to change the approach completely, but to customize certain product features that are crucial for increasing the value of the inventory for new customers.

This approach to mass customization can be labelled as “adaptive customization”, as it prepares customized product designed in a way as to be altered by the customer. It is based on a dialogue with customers that helps them articulate their specific needs – and therefore includes aspects of “collaborative customization” as well – see chapter 2.3.2.

This chapter describes the method of aligning the process of inventory preparation with the customer needs of the target market.

3.3.1. Solution Space

One main task in applying mass customization is to identify those product attributes along which the needs of customers diverge (see chapter 2.3.4).

The following gives an initial assessment of main areas of product attributes of the Austrian Greenhouse Gas Inventory that are relevant to the target market:

- *Area*: Geographical unit: national, federal states, local
- *Drivers*: Detail on driving forces behind the emissions. How are they linked to climate strategy, energy strategy, and other long-term targets in the European Union or national?
- *Transparency*: Level of detail on how the inventory is calculated: complete calculation, main route or a methodology description as text
- *Usability*: Results as excel data, graphs, interpretation

This initial assessment has to be further detailed by an involvement of potential customers. Main questions to be further clarified with customers are:

- How do you check progress in climate policy?
- Who are the people/departments involved, do you do it in-house – or externally?
- Are you satisfied with your assessment – what could be improved?
- Where do you get information, the underlying data, from?
- Is progress check standard – or do you need to adapt it regularly or every time?
- What other related information do you need, would be nice to have?
- Whom do you present the progress check outcome?
- How is the progress check linked with further action?
- How quickly do you need information?
- Do you need similar information year by year – what is your assessment cycle?
- How important is the authoritativeness of the information ?
- How much time do you spend on getting information
- To what do you compare your own progress?
- How important is visualization ?
- Do you need graphs or tables?
- Do you know helpful tools that assess progress in other areas?
- What would a homepage look like that supports you best?

3.3.2. Process Design

The cost of mass customization will mainly depend on the changes needed to the existing production design. A modular process design will help in minimizing additional costs for changes in the demands from customers. These modules include, next to the existing production design, the inclusion of other relevant information to the inventory – that is needed for customization, but not previously needed:

- Module 1: Research Inventory Data and Customization Data (sectoral)
- Module 2: Input Inventory Data & Calculate Emissions (sectoral)
- Module 3: Assemble Inventory and Perform Current Quality Checks (central)
- Module 4: Cross-check Customization Data (central – sectoral)
- Module 5: Assess Usability of Customized Data and Revise Definition of Customized Data

All of these modules would have to be implemented in a way as to be an integral part of the quality management system. It has up to now already been a problem that experts preparing the inventory were not aware of other parameters relevant for their sector but were not needed for the inventory directly. This modular approach would give the sectoral experts the possibility to include all these information into the inventory process (as customized data).

3.3.3. Choice Navigation

Different options bring about a burden of choice for customers of the Austrian Greenhouse Gas Inventory. The willingness to bear this burden of choice will be one of the key differentiating features between the customers within the target market.

This can be addressed by a set of pre-define customer choices as a navigation support (embedded configurations). But continuous interaction with customers will have to ensure that their specific willingness is taken care of. One way of selecting pre-defined customer choices is to research the current navigation support on the internet in similar service providers.

Internet Research on the Choice Navigation of Similar Products

An internet research on solutions for similar products brought about the following results:

UK Inventory Service (DEFRA, 2009): Gives a choice between “international agreements”, “national system summary”, and “GHG emissions per sector”. Presents data tables as ZIP and related reports as PDF. Some summary figures available. No customization possibilities.

UK National Atmospheric Emission Inventory (AEA-Technology, 2009): Gives a choice on “tools for emission inventories”, “UK emission estimates”, “UK emission factors”, “UK activity data”, “mapped emission data”, and “mapped activity data”. The online

database included and the UK emission estimates give the possibility to customize pollutant, and year. The output is ASCII table in html.

US EPA's Clearing House for Inventories & Emission Factors (Environmental Protection Agency U. S., Technology Transfer Network, 2009): Gives a choice between "emission inventories", "emission factors", "emission modelling", and "emission monitoring knowledge base". Presents detailed data used in the inventory. Includes tables, instructions on modelling and reasoning for the methodological choice. No customization possibilities.

US EPA's Greenhouse Gas Emissions Home Page (Environmental Protection Agency U. S., Climate Change - Greenhouse Gas Emissions, 2009): Gives a choice on "overview by gas", "inventory", "projections", and "project methodologies". Presents graphs and tables related to emission data. No customization possibility.

California's Air Resources Board Emission Inventory (Environmental Protection Agency C. , 2009): tables and figures. Initial page gives a choice on "where can I find a table on emission data", "how are emissions estimated", "what pollutants are emitted", "what is the situation in my neighbourhood", "what resources are available", and "what about climate change"

The Australian National Pollutant Inventory (Department of the Environment, 2009): Newly released. Includes a new section on "educational", apart from the following choices "NPI data", "substances", "reporting emissions and transfers", "reducing pollution". The data section includes fact sheets on pollutants plus a data base that can be customized along "location, substance, source, and facility". It also has the possibility to create a map, that can be customized, i.e. zoomed in or out for a national or local perspective. There is no possibility to remember search criteria. The educational pages distinguish between students and teachers. Students have access to "substance fact sheets", "pollution maps", a "true/false quiz", and a "pollution tracker ballad" – read out by children. The pollution maps let the user play a game of 'tracking pollution across Australia'. Different 'scouts' standing on the map of Australia, answer questions to where emissions come from in a graphically animated way. The teacher's section includes a curriculum of how to teach inventory knowledge. It provides teaching material for "caring for the air", "explore the effects of pollution", and "looking forward – emission to air, land and water".

European Environment Agency (Environment Agency, 2009): The data & maps section gives a choice on "data sets", "maps and graphs", "interactive maps", "indicators", and "data providers and partners". The data sets can be customized along "topic", "geographical coverage", "quick links", and "interactive data viewers". The "interactive greenhouse gas viewer" gives you a list of predefined views that can be shown as "chart" or "grid". This can be further customized by choosing options from "measures", "emission source", "emission unit", "year", or "geographical entity". The data can be directly downloaded as excel. 'The EEA GHG viewer provides easy access and analysis of the data contained in the Annual European Community Greenhouse gas inventory 1990-2007 and inventory report 2009.

4. RESULTS

STRATEGIC OPTIONS TO OVERCOME CUSTOMIZATION CHALLENGES AND DEVELOP SPECIFICATIONS FOR A CONFIGURATOR OF THE AUSTRIAN GREENHOUSE GAS INVENTORY

This chapter summarizes the main results from the competitive analysis in the previous chapter and gives some ideas on strategic options that are consistent with the context for Umweltbundesamt and the Austrian Greenhouse Gas Inventory.

This is followed by recommendations on the process of customization by taking special care of the non-profit character of the process to establish the inventory and the opportunity to define a customization aim with a high degree of strategic fit to the mission statement and legal basis of Umweltbundesamt.

Draft specifications on a potential configurator for the Austrian Greenhouse Gas Inventory conclude this chapter. These are meant as an input to a follow-up project at Umweltbundesamt that develops the specification for related prototype software.

4.1. STRATEGIC OPTIONS FOR THE AUSTRIAN GREENHOUSE GAS INVENTORY

Context

In general, non-profit organizations have to face rather complex relations between funding and long- and short-term goals since income often does not come directly from its customers. For the Austrian Greenhouse Gas Inventory, as a non-profit service based on legal requirements, this relation between funding and goal is specified in the Environmental Control Act, the founding act for Umweltbundesamt (see annex 1).

The main long-term goal of *supporting national environmental policy* - and the *exclusive right to take on environmental control* for the Ministry of the Environment - is linked to a budget that is nominally frozen in time as an annual fixed subsidy. There is a further provision that provides funding flexibility through the possibility to '*carry out relevant tasks for third parties*', as long as it is in the general interest and consistent with supporting environmental policy. This short-term goal is linked to '*at least cost-covering reimbursement*', thus presenting an opportunity for additional income that goes beyond covering costs (quotes taken from §6 Environmental Control Act, see annex 1).

This creates a framework wherein the Austrian Greenhouse Gas Inventory has to find strategic options that open new funding possibilities that at the same time support environmental policy. Based on strengths and weaknesses identified in the strategic analysis in chapter 3.1, the strategic options presented below aim at giving direction to the available choices for the Inventory about "where to compete" and "how to compete".

Competitive Analysis – Main Results

Industry Analysis

Suppliers: Statistics Austria is one of the main suppliers for the Inventory. They are crucial for quality improvements in content or timing.

The University of Graz is one of the main contractors, delivering model results that can't be done in-house.

Substitute: There is no direct alternative available for the Inventory. But a range of offers for environmental data, in particular from other non-profit organizations like the Austrian Energy Agency.

Environmental consultants, like Denkstatt, increased their business over recent years - further growth expected.

New Entrants: Only a legal change could remove the responsibility for the Inventory. But newly founded consultancies focus directly on support to firms in producing environmental accounts.

They can deliver highly customized products with entrepreneurial spirit and low administrative costs.

Buyer: The Ministry of the Environment is the formal customer, setting the rules for the quality of the Inventory. But budget restrictions and the work plan process within U reduces its negotiation power.

The main driver for the buying decision on customized products or services based on the Inventory is value added, rather than costs.

Company Analysis

Key Strength: Strong capability of the Inventory team to link international specifications with sectoral know-how.

A high degree to which know-how has been institutionalized through a quality management system.

Key Weakness: As yet low capability in marketing and distribution. This is an area where the situation might change in the near future.

A production culture that is focused on the main customer only. This might change with the "Öffnungsprozess" that has customization as one of its core processes.

Threats: Performance limitation through budget restrictions leading in the end for a search of alternative producers for the Inventory.

Take-over of new markets by other non-profit organizations that face similar budget situations.

Opportunities: Finding new products or services that are based on the Inventory but are funded directly by new customers.

Using synergies between these new products or services while supporting environmental policy.

Ensuring that this value to other customers can be produced without adding unnecessary costs to the current production process.

Basic Strategic Options

Option 1: Sell customized versions of the Austrian Greenhouse Gas Inventory

This option combines the key strength of a highly capable inventory team with the potential for additional funding through new customers. The critical success factor here will be the actual size of the market and the clear communication of Umweltbundesamt's unique selling proposition.

The former will be linked to an accurate and unbiased appraisal of the actual market potential for customized inventories. The latter will be the linked, internally, with the acceptance of this customization challenge by the Inventory team; and externally, with the capability to communicate the USP consistently and in harmony with the specific status as an agency that supports environmental policy and undertakes environmental control.

Option 2: Set-up a subsidiary company that performs consultancy services based on the core product of the Inventory

This is an option already mentioned in framework paper to the "Öffnungsprozess" (Rebernig & et.al., 2009). It would be one way of achieving an administrative separation between a non-profit task of preparing the inventory for its main (public) customer and the customization of the results for direct consultancy to companies.

This will be linked with the challenges in setting-up a "profit-minded" legal entity within Umweltbundesamt – and thus be something that would in particular have to be agreed on by the board of directors. This apart from other fundamental legal issues would have to be resolved.

Option 3: Ensure additional funding for the Inventory through sponsoring

Another alternative would be to leave the customer-side of the inventory as it is, since it is a highly successful product with high efficiency – but rather to look at funding, that would not necessarily change the production, but rather the marketing side.

This would have to include a raising of the public awareness of the value of the Inventory for the society. Only after this value is acknowledged by the public, can companies use sponsoring as a way to improve their marketing.

Option 4: Intensify lobbying to get additional state funding for the Inventory

Currently, a Climate Mitigation Law is under preparation. That might increase the status of the Inventory within Austria – as the authoritative tool for compliance checking also on a sectoral and regional level.

Under the (possibly farfetched) assumption that new legal requirements will also bring additional funding, intensified lobbying for the Climate Mitigation Law might also help in improving the quality of the inventory.

4.2. RECOMMENDATIONS TO IMPROVE THE CUSTOMIZATION PROCESS

Customization Aim

One of the main challenges in customizing the Austrian Greenhouse Gas Inventory will be defining the overall aim of the process. And this needs, as the Inventory is a non-profit service, an aim that is linked to the non-monetary mission of Umweltbundesamt and the long-term goals defined in the Environmental Control Act.

Umweltbundesamt's draft mission statement is about providing the society with perspectives for sustainable development and achieving environmental protection through customers. The underlying legal basis names the support to environmental policy and the execution of environmental control as the main long-term goals.

The performance gap for the Ministry of Environment, as the core customer with high environmental impact, is well addressed through the current customization process. This however is not the case for other customers that might have a much lower environmental impact but are much bigger in numbers.

This large number of other customers could, in an adaptation of a term used in a niche strategy for retailing, be labeled as "long-tail" customers. The long-tail strategy postulates that it allows 'to realize significant profit out of selling small volumes of hard-to-find items to many customers instead of only selling large volumes of a reduced number of popular items. The total sales of this large number of "non-hit items" is called the Long Tail' (Wikipedia, 2009).

Replacing profit with environmental impact, Figure 28 illustrates the concept that a high number of customers with specific needs (the yellow area on the right) can equal the impact attributed to a low number of key customers with high impact (green area, left).

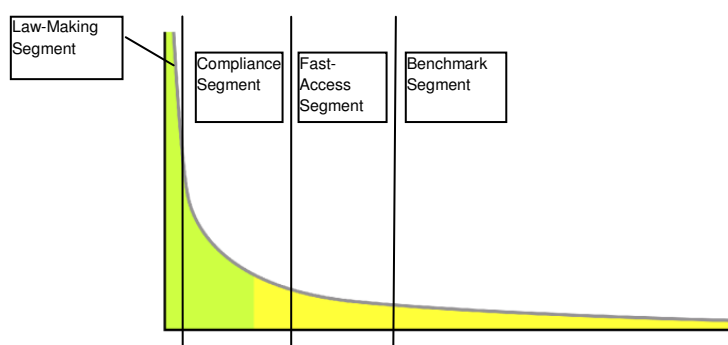


Figure 28: Illustration of the long-tail, adapted from (Wikipedia, 2009)
y-axis: environmental impact (replacing profit); x-axis: number of customers.

The performance gap of these long-tail customers is to get inventory data that is official and relevant to the current situation of the customers' business. And this can then be further defined by attributes like pertinence, consistency, applicability, and others.

Following up on this, the overall aim of customizing the Austrian Greenhouse Gas Inventory could be defined as “*achieving environmental protection through supplying specific inventory-related data to the long-tail of stakeholders for climate change in Austria*”.

How to Earn Money with Customization?

The business idea is to develop a configurator of the Inventory that runs on the data inputs that can be downloaded from the Umweltbundesamt homepage. The configurator tool itself will be free of charge – but the annual data updates, that include the latest updates for compliance checking will be charged.

The assumption is that the number of customers ordering annual updates will cover the costs of developing the configurator tool – and in the long run contribute positively to the running costs of the inventory.

When and How to Involve the Customer?

Chapter 3.2.2 identifies the *compliance segment* as the target market, i.e. public agencies that have the task of checking whether their region or sector is on track in reaching environmental targets related to greenhouse gas emissions.

These customers have specific needs but these needs are supposedly not too far from the needs on a national level, i.e. the needs for Umweltbundesamt itself. The proposal here is, therefore, to involve only some customers mainly after the design phase of the customization when there are already specific prototypes available – to be commented on by these customers. This would also help in reducing the risk of raising expectations that cannot be fulfilled.

Annex 3 gives a list of potential customers to be involved in the detailed design and prototyping phase and the main question to be addressed. The people selected there involve all three segments of the market – since the long-term perspective is that these segments would be addressed later on as well (to cover the whole long-tail).

How to Create a Customization Culture within the Inventory Team?

It will be crucial to involve the key players within the inventory team in defining the customization process. The communication of the non-profit aim and the added benefit for the environment will be the basis for the implementation process. This will be a stepping stone in finding applications for the customization with ‘at least cost-covering reimbursement’.

One way would also be to let the experts propose expected customization benefits and possible customers – and have direct contact with them. This has to be set-up as a kind of bottom-up process that ensures the experts support and their link with customers.

On a more technical level, the project lead of the inventory can prepare prototypes of inventory Configurators that show how the existing data of the inventory could be

customized. And in the end, all process results will have to be included in the quality management system, i.e. be part of the Standard Operating Procedures (“Verfahrensweisungen”).

4.3. DRAFT SPECIFICATIONS FOR A CONFIGURATOR

Initial specification, that will have to be refined with customer input, once a prototype for testing is available, can be given as follows:

- Solution Space
 - o All data related to the Greenhouse Gas Inventory, i.e. six gases, all background data that includes the energy statistics and all other data needed to calculate national emissions
 - o All sectoral detail of the Inventory
 - o Emission data and background data for the federal emission inventory (Bundesländer Luftschadstoff-Inventur, BLI)
 - o Some selected data from EU27 (e.g. national totals)
 - o A set of customized data requirements based on selection of sector experts
- Choice Navigation
 - o The configurator itself can have the look and feel of a work-horse. A too neat outward appearance might deter rather than attract public customers. The aim must be to confer a sense of ‘customized data is our priority – not window dressing’.
 - o But compliance with targets must be visualized, i.e. presented in a way that makes it easy to grasp if national, regional or sectoral targets are missed. This includes the need to update targets, and the possibility for customers to add additional targets that they want to monitor.
 - o The application must have an authoritative look. It must be absolutely clear that this only presents officially approved and validated data. The impression should be rather that of financial database than of management gimmick.
- Process Design
 - o Input data needs to be taken from the Austrian Greenhouse Gas Inventory
 - o An interface has to be defined to download data from the U homepage (incl. payment possibilities)
 - o The data results need to be downloadable in commonly used output formats and be able to be handled by normal computer users.
 - o Open Source
 - The application itself should have an open source character. This includes the possibility for users to further customize the configurator to their needs.

- An exception should be the interface to the download possibility (and payment) at Umweltbundesamt
- User involvement
 - Configurator usages should be made available to Umweltbundesamt – so that conclusions for further improvements can be made
 - It would be good to create a user community that exchanges ideas on customizing the configurator – and that Umweltbundesamt would host this community

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ANNEX 1: ENVIRONMENTAL CONTROL ACT

Excerpt from the Austrian Environmental Control Act (Federal Legal Gazette No. 152/1998) (Umweltbundesamt, 2010)

Purpose and Tasks of the Federal Environment Agency

§ 6. (1) The Federal Environment Agency is the environmental expert authority of the federal government. As such, the Federal Environment Agency shall,

- a) in compliance with the competence provisions, in particular with the law governing federal ministries, support the environmental policy and its enforcement as it is pursued by the federal government by submitting professional work according to this law,
- b) perform the tasks assigned to the Federal Environment Agency as stipulated in other federal laws,
- c) have the exclusive right to take on the function and tasks of environmental control¹ for the federal minister of agriculture and forestry, environment and water management according to the first section of this federal law,
- d) insofar as it is in the general interest and in accordance with the fulfillment of the tasks stipulated in letters a to c, carry out relevant tasks for third parties against at least cost-covering reimbursement.

(2) According to Para 1, some of the special tasks of the Federal Environment Agency are as follows:

¹ The federal minister of agriculture and forestry, environment and water management shall, in the general interest, for the protection of the environment as a whole and, in particular, in the interest of the conservation, improvement and restoration of natural healthy living conditions for humans, animals and plants

- a) monitor and assess continually the state and development of the environment and of environmental pressures,
- b) as part of his responsibilities, evaluate the state and development of the environment and of environmental pressures for general matters of environmental protection and environmental policy and
- c) make the results of this environmental control accessible to the competent authorities, the National Assembly, the Federal Assembly and the public. The monitoring, assessment and evaluation of the state and development of the environment according to Para 1 letters a and b shall include in particular the causes of hazardous, harmful or irritating environmental impacts and pressures as well as the relevant state of the environment and of the ecosystems with their organisms, material cycles and energy flows in an integrative, cross-media fashion.

1. establish the technical expertise for achieving the defined national objective of „environmental protection“ according to the federal constitutional law on comprehensive environmental protection, Federal Legal Gazette No. 491/1984;
2. provide expert opinion on proposals for environmental directives or regulations, decisions, recommendations or communications of the institutions of the European Union (EU) without prejudice to equal rights of other institutions;
3. provide expert opinion on questions relating to the implementation, application and enforcement of environmental directives or regulations of the EU;
4. provide expert opinion on drafts for national environmental laws or ordinances as well as on environmental programmes and planning undertaken by the public authorities;
5. develop and recommend methods and techniques suitable for combating environmental pollution, with preference, at the source;
6. estimate the environmental impact of economic activities and technical procedures;
7. elaborate proposals for the implementation and application of the integrative, cross-media approach of the environmental policy of the EU with the aim of a high level of protection for the environment as a whole;
8. determine, describe and recommend the best available techniques for avoiding or reducing hazardous or irritating emissions;
9. participate in the exchange of information on the best available techniques according to Art. 16 of Directive 96/61/EC;
10. keep an inventory of emissions according to Art. 15 Para 3 of the Directive 96/61/EC, keep a database of emissions from steam boilers serving as a basis for complying with reporting obligations stipulated in Art. 13 of Council Directive 88/609/EEC;
11. participate in the elaboration of environmental quality criteria and define stress limits;
12. deal with issues of the European Environment Agency, National Focal Point for the Clearinghouse Mechanism and establish the technical expertise for the implementation of the Convention concerning the Conservation of Biodiversity, Federal Legal Gazette No. 213/1995, as well as for UNEP-Infoterra;
13. co-ordinate the national quality assurance programmes designed for air quality monitoring according to Art. 3 of Council Directive 96/62/EC;
14. elaborate and provide data in such a form as to enable a link between the description of environmental impacts and economic activities;
15. establish the technical expertise for compliance with the Convention on Long-Range Transboundary Air Pollution, Federal Legal Gazette No. 158/1983, including its protocols as well as with the United Nations Framework Convention on Climate Change, Federal Legal Gazette No. 414/1994, and with the Kyoto Protocol including the preparation of emissions balance sheets and an estimation of the effect of measures, participate in the preparation of national climate reports;
16. present work results in national and international expert groups, participate in the elaboration and negotiation of international agreements in the field of

- environmental protection, including radiation protection and genetic engineering;
17. provide expert support for the preparation and implementation, application and enforcement of environmental bilateral agreements or agreements under Community law;
 18. participate in the elaboration of the technical expertise for law and ordinance drafts and for drafts of agreements according to Art. 15a of the Federal Constitutional Law in the field of air pollution control and air quality protection as well as climate and soil protection;
 19. participate in the compliance with the reporting obligations to the European Commission according to directives and decisions of the EC and prepare for compliance with national reporting obligations, in particular prepare the periodic state of the environment reports according to § 3, prepare for compliance with the reporting obligations according to § 23 Para 1 of the Air Quality Protection Act, Federal Legal Gazette I No. 115/1997, prepare reports on air quality according to § 6 Para 2 of the Ordinance concerning reports on air quality, Federal Legal Gazette No. 678/1992, and daily, monthly and annual reports as stipulated in the monitoring concept Ordinance according to § 7 of the Air Quality Protection Act, participate in the preparation of reports on ozone according to § 12 of the Austrian Ozone Act;
 20. develop and keep inventories, balances, registers, and environmental information systems to document the state and development of the environment, of environmental stresses and their causes, derive environmental indicators and indicators of sustainability;
 21. develop and keep meta-information systems of environmental data, in particular the environmental data catalogue according to the Environmental Information Act, Federal Legal Gazette No. 495/1993, and document karst-hydrologic studies;
 22. carry out analyses and stock-taking of waste management as part of the enforcement of the Austrian Waste Management Act, Federal Legal Gazette No. 325/1990, in particular for the Federal Waste Management Plan, establish and keep waste management databases, in particular the Austrian hazardous waste register according to the Austrian Waste Management Act, the register of suspected contaminated sites and the register of contaminated sites according to the Law for the Clean-Up of Contaminated Sites, Federal Legal Gazette No. 299/1989, as well as participate in the national and international reporting obligations in the field of waste management;
 23. provide expert evaluation and participate in the tasks involving the identification, investigation and remediation of suspected contaminated sites and contaminated sites according to Law for the Clean-Up of Contaminated Sites;
 24. carry out tasks of the federal government regarding the measurement of air pollutants and their analysis according to the Smog Warning Act, Federal Legal Gazette No. 38/1989, the Austrian Ozone Act, Federal Legal Gazette No. 210/1992, and the Air Quality Protection Act as well as their relevant ordinances, keep a data network according to § 5 of the Austrian Ozone Act and

- § 6 of the Air Quality Protection Act, carry out detailed air quality assessment according to § 8 of the Air Quality Protection Act, participate in the preparation of lists of measures according to § 10 of the Air Quality Protection Act, draw up emission balances according to § 24 of the Air Quality Protection Act;
25. carry out tasks of the competent authority according to Art. 8 and 9 of the Council Regulation (EEC) No. 1836/93 of 29 June 1993 allowing voluntary participation by companies in the industrial sector in a Community eco-management and auditing scheme according to §§ 15 and 17 of the law on accredited environmental verifiers and lists of registered sites, Federal Legal Gazette No. 622/1995 with the exception of issuing decrees in these matters;
 26. participate in the tasks of the registration authority pursuant to §§ 5 to 15 of the Chemicals Act of 1996, Federal Legal Gazette I No. 53/1997;
 27. participate in the enforcement of § 16 of the Chemicals Act of 1996 according to Council Regulation (EEC) No. 793/93 and keep a central register according to §§ 54 and 55 of the Chemicals Act of 1996 as well as other registers of substances and preparations;
 28. advise the federal minister of agriculture and forestry, environment and water management on matters of risk evaluation, the safety data sheet as well as the classification and labelling of substances, participate in the inspection carried out by inspection bodies according to the GLP inspection programme;
 29. provide expert opinion on notifications for obtaining consent to the deliberate release of GMOs (according to § 37 Para 6 of the Genetic Engineering Act, Federal Legal Gazette No. 510/1997) and on notifications for obtaining consent to the deliberate release and/or the placing on the market of GMOs according to Council Directive 90/220/EEC as well as participation in matters of § 87 Para 3 of the Genetic Engineering Act, co-operation in the “competent authority” committee according to Council Directive 90/220/EEC, participation in technical issues concerning GMO studies in contained systems;
 30. participate in inspections carried out as part of the enforcement responsibilities of the federal minister of agriculture and forestry, environment and water management in the field of chemical substances and genetic engineering;
 31. participate in the checking and monitoring of compliance with obligations in the field of waste management and the clean-up of contaminated sites pursuant to § 6 Para 1 letter a;
 32. provide expert opinion on environmental impact statements according to § 5 Para 5 of the Environmental Impact Assessment Act, Federal Legal Gazette No. 697/1993; keep EIA documentation according to § 43 Para 1 of the EIA Act;
 33. evaluate pesticides and other biocidal products as part of the enforcement of the Pesticides Act of 1997, Federal Legal Gazette I No. 60/1997, as well as Austrian national measures for the implementation of Council Directive 98/8/EC, participate in EU assessments of active ingredients;
 34. provide data according to § 33e of the Austrian Water Act of 1959, Federal Legal Gazette No. 215/1959, and exchange data according to § 6 Para 3 of the Hydrography Act, Federal Legal Gazette No. 58/1979;

35. carry out measurements, observations, examinations and tests to identify emissions, ambient air pollution and other impacts on the state and the development of the environment, in particular as part of the function and tasks of environmental control according to § 6 Para 1 letter c;
36. receive notifications or complaints about environmental pollution or grievance as part of the tasks of environmental control and/or pass on such notifications or complaints to the competent authorities;
37. write reports on work results, train and give further education to specialist staff of the public administration in the field of environmental protection;
38. advise the federal minister of agriculture and forestry, environment and water management on practice-related questions of chemical environmental analysis, quality management in environmental analysis and on the providing and retaining of laboratory capacity in the event of a crisis or emergency;
39. The federal minister of agriculture and forestry, environment and water management may order the Federal Environment Agency to carry out, as part of the activities assigned to it by law, certain tasks for him or for third parties. For such tasks, without prejudice to § 11 concerning the funding of the Federal Environment Agency, reimbursement has to be provided to reimburse the costs of the Federal Environment Agency unless the costs for these tasks are covered by the annual flat subsidy according to § 11 Para 2.

ANNEX 2: BACKGROUND ON THE AUSTRIAN GREENHOUSE GAS INVENTORY

(Anderl, et al., 2009)

Responsibilities within the Inventory

Austria's reporting obligations to the UNFCCC, UNECE and EC are administered by the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW). With the Environmental Control Act ("Umweltkontrollgesetz"; Federal Law Gazette 152/1998) that entered into force on the 1st of January 1999 the Umweltbundesamt has been designated as single national entity with overall responsibility for inventory preparation. This law regulates responsibilities of environmental control in Austria and lists the tasks of the Umweltbundesamt. One task is the preparation of technical expertise and the data basis for fulfilment of the obligations under the UNFCCC and the UNECE LRTAP Convention. Thus the Umweltbundesamt prepares and annually updates the Austrian air emissions inventory ("Österreichische Luftschadstoff-Inventur OLI"), which covers greenhouse gases and emissions of other air pollutants as stipulated in the reporting obligations.

Within the Umweltbundesamt the department of Emissions and Climate Change is responsible for the preparation of the Austrian Air Emission Inventory ("Österreichische Luftschadstoff- Inventur OLI") and all work related to inventory preparation. Responsibilities are divided by sectors between sector experts from Departments within the Umweltbundesamt. The "Inspection body for GHG inventory" within the Umweltbundesamt is responsible for the compilation of the greenhouse gas inventory. The quality system is maintained and updated under the responsibility of the Quality Manager. The Quality Manager has direct access to the top management.

For the Umweltbundesamt a national air emission inventory that identifies and quantifies the sources of pollutants in a consistent manner is of a high priority. Such an inventory provides a common means for comparing the relative contribution of different emission sources and hence can serve as an important basis for policies to reduce emissions.

Institutional Arrangements in Place

Besides the Environmental Control Act there are some other legal and institutional arrangements in place as the main basis for the national system:

- Ordinance regarding Monitoring and Reporting of Greenhouse Gas Emissions²
- This ordinance pertains to the Austrian Emissions Certificate Trading Act³ that regulates monitoring and reporting in the context of the EU Emissions Trading scheme (ETS) in Austria.
- Paragraph 15 of this ordinance is designed to ensure consistency of emission trading data with the national inventory. It states that the Umweltbundesamt has to incorporate, as far as necessary, the emission reports of the emissions trading scheme into the national greenhouse gas inventory in order to comply with requirements of the EU Monitoring Mechanism Decision (280/2004/EC) and the UNFCCC. This is not only important for emissions from combustion of fuels, where more detailed information than provided in the national energy balance is available, but also for emissions from industrial processes, where the ordinance ensures data availability for most key categories. First data from the EU ETS were available for the year 2005; since then ETS data were considered in the submissions.
- The Austrian statistical office (Statistik Austria) is required by contract with the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) and with the Federal Ministry of Economics and Labour (BMWA) to annually prepare the national energy balance (the contracts also cover some quality aspects). The energy balance is prepared in line with the methodology of the Organisation for Economic Co-operation and Development (OECD) and is submitted annually to the International Energy Agency (IEA) (IEA/EUROSTAT Joint Questionnaire (JQ) Submission). The national energy balance is the most important data basis for the Austrian Air Emissions Inventory.
- According to national legislation (Bundesstatistikgesetz⁴), the Austrian statistical office has to prepare annual import/export statistics, production statistics and statistics on agricultural issues (livestock counts etc.), providing an important data basis for calculating emissions from the sectors Industrial Processes, Solvents and Other Product Use and Agriculture.

² „Verordnung des Bundesministers für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft über die Überwachung und Berichterstattung betreffend Emissionen von Treibhausgasen“, Federal Law Gazette II No. 458/2004

³ “Emissionszertifikate-Gesetz”, Federal Law Gazette I No. 46/2004

⁴ “Bundesstatistikgesetz”, Federal Law Gazette I No. 163/1999

- In order to comply with the reporting obligations, the Umweltbundesamt has the possibility to obtain confidential data from the national statistical institute (of course these data have to be treated confidentially). The legal basis for this data exchange is the “Bundesstatistikgesetz” (federal statistics law), which allows the national statistical office to provide confidential data to authorities that have a legal obligation for the processing of these data.
- According to para 17 (1) of the (EG-K)⁵ each licensee of an operating boiler with a thermal capacity of 2 megawatts (MW) or more is obligated to report the emissions to the competent authority. The Umweltbundesamt can request copies of these emission declarations. These data are used to verify the data from the national energy balance for the Energy sector.
- According to the Landfill Ordinance (Deponieverordnung)⁶, which came into force in 1997, the operators of landfill sites have to report their activity data annually to the Umweltbundesamt, where they are stored in a landfill database for solid waste disposals (Deponiedatenbank). This data provide the main data basis for calculating emissions from the sector Waste.
- Since 2004 there is a reporting obligation to the BMLFUW under the Austrian Fluorinated Compounds (FC) Ordinance⁷ for users of FCs for the following applications: refrigeration and air-conditioning, foam blowing, semiconductor manufacture, electrical equipment, fire extinguishers and aerosols. These data are used for estimating emissions from the consumption of fluorinated compounds (IPCC sector 2 F).

Adaptation to the Kyoto Protocol

Regulations under the UNFCCC and the Kyoto Protocol define new standards for national emission inventories. These standards include more stringent requirements related to transparency, consistency, comparability, completeness and accuracy of inventories. Each Party shall have in place a national system, no later than one year prior to the start of the first commitment period; this means by the end of 2006. Also the European Community had to implement such a national system, and as this system is also based on the national systems of the member states, member states had to

⁵ „Emissionsschutzgesetz für Kesselanlagen“, Federal Law Gazette I No. 150/2004

⁶ „Deponieverordnung“, Federal Law Gazette 164/1996

⁷ „Industriegas-Verordnung (HFKW-FKW-SF6-VO)“; Federal Law Gazette II No. 447/2002 Austria’s National Inventory Report 2009

implement their national system earlier than required by the UNFCCC and the KP, namely by 31 December 2005 (Article 4 of the Monitoring Mechanism Decision 280/2004/EC).

This national system shall include all institutional, legal and procedural arrangements made within a Party for estimating anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and for reporting and archiving inventory information.

Austria's aim was to set up a national system that fulfils all the requirements of the Kyoto Protocol and also works as an efficient system to fulfill all the other obligations regarding air emission inventories Austria has to comply with.

The Austrian Air Emission Inventory, comprising all air pollutants stipulated in the various national and international obligations, is at the centre of NISA. The national system and the quality management system have been incorporated into NISA as complementary sections.

The Guidelines for National Systems for the Estimation of Anthropogenic Greenhouse Gas Emissions by Sources and Removals by Sinks under Article 5.1 of the Kyoto Protocol (Decision 19/CMP.1) describe the elements to be included in a national system.

The overall goal of National Systems is to ensure the quality of the inventory through planning, preparation and management of inventory activities. National Systems should enable Parties to estimate emissions in accordance with the relevant inventory guidelines [IPCC Guidelines and Good Practice Guidance (GPG)] to comply with the requirements of the Kyoto Protocol.

The general principles for National Inventories are transparency, consistency, comparability, completeness and accuracy of inventories and the quality of inventory activities (e.g. collecting activity data, selecting methods and emission factors).

The general functions are:

- to establish and maintain the institutional, legal, and procedural arrangements defined in the guidelines for national systems between the government agencies and other entities,
- to ensure sufficient capacity for timely performance,
- to designate a single national entity with overall responsibility for the national inventory,
- to prepare national annual inventories and supplementary information in a timely manner and
- to provide information necessary to meet the reporting requirements.

Specific functions stipulated in these guidelines are inventory planning, preparation and management.

Austria has taken significant steps to establish a high-quality emission inventory in which uncertainties are reduced as far as feasible and in which data are developed in a transparent, consistent, complete, comparable and accurate manner. The following steps have been taken to prepare NISA to meet the requirements of the Kyoto Protocol:

- the Umweltbundesamt has been designated as the single national entity with the overall responsibility for the national inventory by law: the Environmental Control Act (“Umweltkontrollgesetz”; Federal Law Gazette I No. 152/1998) regulates responsibilities of environmental control in Austria and lists the tasks of the Umweltbundesamt. One task is the preparation of technical expertise and basic data for the fulfillment of the obligations under the UNFCCC and the UNECE LRTAP Convention. For further institutional arrangements, please refer to subchapter 1.2.4)
- The responsibilities for inventory planning, preparation and management are specified and allocated within the Umweltbundesamt. Following internal Umweltbundesamt quality management regulation, a yearly plan is implemented to ensure capacity for timely performance of the functions defined in the guidelines for national systems. The technical competence of the staff involved in the inventory preparation process is ensured by arrangements according to the internal Umweltbundesamt training plan.
- The inventory preparation, including identification of key categories, uncertainty estimates and QC procedures, is performed according to the 2000 Intergovernmental Panel on Climate Change (IPCC) Good Practice Guidance (GPG) and Uncertainty Management of Greenhouse Gas Inventories and to the 2003 IPCC GPG for Land Use, Land-Use Change and Forestry.
- A Quality Management System (QMS) has been developed and implemented.
- The national greenhouse gas inventory is prepared by the inspection body for GHG inventories within the Umweltbundesamt which is accredited as inspection body according to the International Standard ISO/IEC 17020 General Criteria for the operation of various types of bodies performing inspections. The accreditation audit of the Umweltbundesamt as inspection body took place in September 2005. The accreditation was completed officially in December 2005.
- The QMS also includes the necessary procedures to ensure quality improvement of the emission inventory. They comprise documentation of allocated responsibilities, of any discrepancies and of the findings by UNFCCC review experts in particular.

- The inventory management as part of the QMS includes a control system for data and calculations, for records and their archiving as well as documentation of QA/QC activities. This ensures the necessary documentation and archiving for future reconstruction of the inventory and for the timely response to requests during the review process.
- Part of the legal and institutional arrangements in place to provide a basis for the national system pertains to data availability for the annual compilation of the GHG inventory. The main data source for the Austrian inventory preparation is the Austrian statistical office (Statistik Austria). The compilation of several statistics is regulated by law; the compilation of the national energy balance is regulated by contracts. Other data sources include reporting obligations under national and European regulations and reports of companies and associations.
- A process for official consideration and approval of the inventory prior to its submission is established. The inventory information is provided by the Umweltbundesamt to the Federal Ministry of Agriculture, Forestry, Environment and Water Management, where the National Focal Point for the UNFCCC is established. The inventory is then submitted by the Ministry to the UNFCCC secretariat.

The Austrian national system was reviewed during the in-country review of the initial report of Austria (February 2007). Para 10 of the review report (FCCC/IRR/2007/AUT) states that the national system has been developed in line with the relevant guidelines and can fulfil the requirements of the Kyoto Protocol as well as other obligations regarding its air emissions inventory that Austria has to comply with.

Inventory Preparation Process

The present Austrian greenhouse gas inventory for the period 1990 to 2007 was compiled according to the recommendations for inventories set out in the UNFCCC reporting guidelines according to Decision 18/CP.8, the Common Reporting Format (CRF) (version 1.01), Decision 13/CP.9, the new CRF for the Land Use Change and Forestry Sector, the IPCC 1996 Guidelines for National Greenhouse Gas Inventories, which specify the reporting obligations according to Articles 4 and 12 of the UNFCCC (IPCC Guidelines, 1997) as well as the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (IPCC GPG, 2000) and the IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry (IPCC GPG-LULUCF, 2003).

The preparation of the inventory includes the following three stages:

- (i) inventory planning,
- (ii) inventory preparation and

(iii) inventory management.

During the first stage specific responsibilities are defined and allocated: as mentioned before, the Umweltbundesamt has the overall responsibility for the national inventory, which comprises greenhouse gases as well as other air pollutants. Within the inventory system specific responsibilities for the different emission source categories are defined (“sector experts”) as well as for all activities related to the preparation of the inventory, including QA/QC, data management and reporting.

In Austria, emissions of greenhouse gases are estimated together with emissions of air pollutants in a single database based on the CORINAIR (CORe INventory AIR)/SNAP (Selected Nomenclature for sources of Air Pollution) nomenclature. This nomenclature was designed by the ETC/AE (European Topic Centre on Air Emissions) to estimate not only emissions of greenhouse gases but all kind of air pollutants.

During the second stage, the inventory preparation process, sector experts collect activity data, emission factors and all relevant information needed for finally estimating emissions. The sector experts also have specific responsibilities regarding the choice of methods, data processing and archiving and for contracting studies, if needed. As part of the quality management system the head of the “Inspection body for GHG inventory” approves the methodological choices. Sector experts are also responsible for performing Quality Control (QC) activities that are incorporated in the Quality Management System (QMS). All data collected together with emission estimates are fed into a database (see below), where data sources are well documented for future reconstruction of the inventory.

As mentioned above, the Austrian Inventory is based on the SNAP nomenclature, and has to be transformed according to the IPCC Guidelines into the UNFCCC Common Reporting Format to comply with the reporting obligations under the UNFCCC. In addition to the actual emission data, the background tables of the CRF are filled in by the sector experts, and finally QA/QC procedures as defined in the QA/QC plan are carried out before the data are submitted to the UNFCCC.

For the inventory management a reliable data management to fulfill the data collecting and reporting requirements is needed. As mentioned above, data are collected by the different sector experts and the reporting requirements grow rapidly and may change over time. Data management is carried out by using MS Excel™ spreadsheets in combination with Visual Basic™ macros, which is a very flexible system that can easily be adjusted to new requirements. The data are stored in a central network server which is backed up daily for the needs of data security. Furthermore, as part of the QMS, backups of the entire inventory information are made twice a year on write-protected DVDs. The inventory management as part of the QMS includes a control system for all documents and data, for records and their archives as well as documentation on QA/QC activities (see Chapter 1.6).

This ensures the necessary documentation and archiving for future reconstruction of the inventory and for the timely response to requests during the review process.

ANNEX 3: POTENTIAL INTERVIEW PARTNERS AND MAIN QUESTIONS

Recommended Interview Partners (Initials)

Compliance Segment

- A. D. (Federal States' Coordinator for Climate Mitigation)
- M. S. (City of Vienna)
- G. S. (Federal State of Salzburg)
- F. F. (Economy Ministry – Kyoto Task Force)
- M. S. (Ministry of Agriculture)
- C. S. (Chamber of Workers)

Fast-Access Segment

- C. D. (PriceWaterhouseCooper)
- R. G. (Publico)
- W. K. (Denkstatt)
- S. S. (University Graz)

Benchmark Segment

- A. L. (Wienerberger)
- R. Z. (OMV Carbon Management)
- H. S. (Voest – Environment)
- R. G. (EXAA)

Recommended Question to be Addressed

- Do you, and if yes how do you check progress in climate policy
- Who are the people/departments involved, do you do it in-house – or externally
- Are you satisfied with your assessment – what could be improved
- Where do you get the information, the underlying data, from
- Is progress check standard– or do you need to adapt it regularly/every time
- What other related information do you need, would be nice to have
- To whom do you present the progress check outcome
- How is the progress check linked with further action
- How quickly do you need this information
- Do you need similar information year by year – what is your assessment cycle
- How important is the authoritativeness of the information
- How much time do you spend on getting information

- To whom do you compare your own progress
- How important is visualization
- Do you need graphs or tables
- Do you know helpful tools that assess progress in other areas
- How would a homepage look that supports you best