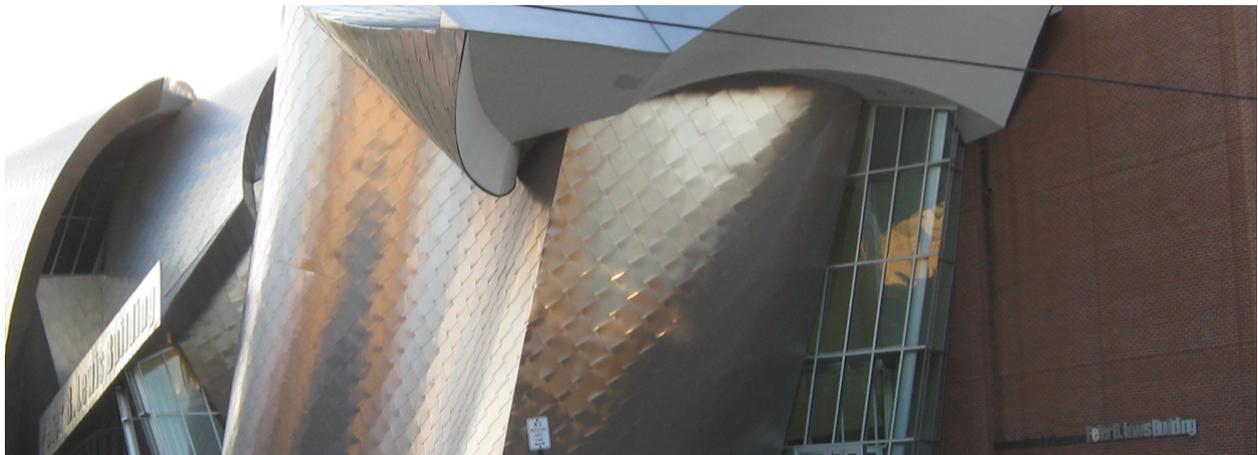

Appreciative Inquiry in Chemical Engineering

Positive Design, Generativity, and Product Development

Master Thesis



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Technical University of Denmark



Abstract

The purpose of this master thesis has been to explore how Appreciative Inquiry can be used in chemical engineering. The aim has been to develop an appreciative process model for chemical product development.

A theoretical approach has been used to investigate four organizational subsystems; people, structure, task, and technology, for the potential of using Appreciative Inquiry in each of them, and to turn the obtained knowledge into suggestions on how to use Appreciative Inquiry in chemical engineering.

It has been discovered that Appreciative Inquiry is capable of creating a new approach to involve and develop people in organizations, to design organizational structures and processes, and to shape the purpose of organizations. It has also been found that the conventional process for chemical product development has a potential for improvement based on appreciative approach.

The conclusion was that Appreciative Inquiry can be applied in chemical product development; either by using appreciative methods within the conventional process or by using the appreciative process model which is developed in the report.

Foreword

I am now handing in the thesis to conclude my education as Master of Science and Engineering. I want to share some concluding thoughts with all of you that have been a part of this journey or will be by reading this report.

My first experiences with Appreciative Inquiry have been at wonderful events arranged by the Danish Scout and Guide Association. They have inspired me to live out the principles of Appreciative Inquiry, and I have done ever since.

I have been fortunate to experience some of the most wonderful professors and students during my education at the Technical University of Denmark. They have inspired me to carry out ground-breaking research, intense projects, and even curious experiments at DTU and at home. All the late nights with good company at DTU have been memorable. My most appreciable time at DTU has been with chemical product development; where Hans Wesselingh, Søren Kiil, and Martin Vigild have contributed to inspirational learning. I also want to send my thoughts to Professor Claus Hviid Christensen for being my most inspiring and embracing professor. My thoughts also go to my other inspiring teaching assistants and professors.

The two interest fields of Appreciative Inquiry and Chemical Product Development became one as I approached this master thesis. When I had the opportunity of spending three months during the project period in Cleveland, Ohio, where Appreciative Inquiry originates from, I had to take it.

The thesis has been conducted at DTU Management Engineering at the Technical University of Denmark. I want to thank my supervisor Associate Professor Niels Møller for encouraging me to take on the challenging adventure this journey has been, and for his valuable inspiration and support during the project.

The time in Cleveland was an unforgettable experience of late hours at the library with priceless literature about Appreciative Inquiry. It also gave me another chance of growing accustomed to the American culture. I also found an opportunity to visit my old home at the University of Wisconsin in Madison and to enhance my passion for college football - Go Badgers! I am grateful for receiving the scholarships that gave me the opportunity.

The picture on the front page is the Weatherhead School of Management building at Case Western Reserve

University. It is designed by Frank Gehry and is a symbol of Appreciative Inquiry, Managing as Designing, Design through a Positive Lens, Business as an Agent of World Benefit, and all the other appreciative approaches that have emerged from this inspiring architecture.

I want to thank the giants for letting me stand on their shoulders. Thank you for sharing your work with the world.

During the past months I have experienced loneliness, company, boredom, adventure, music, silence, and love: *“All those days that arrived and left again. I never knew that they were life itself. Not until now.”*

To my friends from the Danish Scout and Guide Association; thank you for having shared the best moments with me.

I want to thank my wonderful family for endless inspiration from our adventures and moments together, and for raising me into a world where nothing is impossible.

My dearest thanks go to Camilla for continuous support, for our shared moments, and for helping me until the end.

David Hansen, s042290,
Technical University of Denmark,
Kgs. Lyngby, 1st of February 2010.

Contents

Abstract	iii
Foreword	iv
1 Introduction	1
1.1 What is My Curiosity About?	2
1.1.1 People	4
1.1.2 Structure	4
1.1.3 Task	5
1.1.4 Technology	5
1.1.5 Applying Appreciative Inquiry in Chemical Engineering	6
1.2 Scope and Outline	6
1.2.1 Methodology	7
1.3 Terminology	8
2 People: The Positive Revolution	9
2.1 The Positive Revolution	10
2.1.1 Positive Psychology	10
2.1.2 Positive Organizational Scholarship	12
2.1.3 Positive and Appreciative Leadership	14

2.2	Social Constructionism	19
2.2.1	Systemic Thinking	21
2.2.2	Implications for People and Relations	22
2.3	Appreciative Inquiry	24
2.3.1	Principles and Assumptions behind Appreciative Inquiry	25
2.3.2	Generativity in Appreciative Inquiry	29
2.4	How can the Approaches be used in Chemical Engineering?	34
2.4.1	Team Work with an Appreciative Approach	34
2.4.2	The Process of Technical Inquiry through Appreciative Inquiry	36
2.4.3	AI in Management and Organizational Structure	36
2.5	Summary	37
3	Structure: Design of Appreciative Organizations	39
3.1	Appreciative Design	40
3.1.1	Managing as Designing	40
3.1.2	Design with a Positive Lens	42
3.2	Designing Appreciative Organizations	46
3.2.1	Principles of Appreciative Organizing	46
3.2.2	How to Organize without Coordination	51
3.2.3	Chaordic Organizations	53
3.2.4	Inspiration from the Arts	56
3.2.5	What should be Designed in Organizations?	57
3.2.6	Designing Appreciative Engineering Organizations	60
3.3	Appreciative Processes	60
3.3.1	The Role of Questions in Design	61
3.3.2	Circular Questions	62
3.3.3	The Appreciative Inquiry Process	65
3.3.4	The Appreciative Inquiry Summit	68
3.3.5	Inspiration from the Poetics	71
3.3.6	Inspiration from the Theory of Sculpture	74
3.3.7	Evaluation and Learning	77
3.3.8	Inspiration for Chemical Product Development Processes	78

4 Task: Business Sustainability	81
4.1 Appreciative Inquiry Transforms the Purpose of Organizations	81
4.1.1 Positive Meaning	82
4.1.2 Encouraging Dialogue and Cooperation	83
4.2 Business as an Agent of World Benefit	83
4.2.1 The Conventional Model of Business	84
4.2.2 The Appreciative Model of Business	85
4.3 Chemical Engineering for World Benefit	88
4.3.1 Green and Sustainable Chemistry	88
4.3.2 Sustainability and World Benefit	90
4.4 Summary	91
5 Technology: Chemical Product Development	93
5.1 Fundamentals of Chemical Product Development	94
5.1.1 Master Planning	96
5.1.2 Conventional Chemical Product Development	98
5.2 Process and Methods for Chemical Product Development	99
5.2.1 Project Start-Up	100
5.2.2 Concept Generation and Selection	100
5.2.3 Product Development	107
5.2.4 Production	108
5.3 Summary	108
6 Appreciative Product Development	110
6.1 Appreciative Methods in Conventional Chemical Product Development	111
6.1.1 The Appreciative Attitude in Engineering	111
6.1.2 The Start-Up Phase	113
6.1.3 Concept Generation and Selection	116
6.1.4 Product Development	119
6.1.5 Production	120
6.1.6 Appreciative Evaluation	122
6.2 Appreciative Process for Chemical Product Development	123
6.2.1 Process Model for Appreciative Chemical Product Development	124
6.2.2 Definition	125
6.2.3 Discovery	126

6.2.4	Dream	128
6.2.5	Design	130
6.2.6	Destiny	132
6.2.7	Discussion of the Validity of the Process Model	134
6.2.8	Future Test of the Process Model	137
6.3	Perspectives	137
7	Conclusion	139
8	Bibliography	141

1

Introduction

What is Appreciative Inquiry? It is a methodology of positive change that engages people to discover their successes and strengths from the past and use them to dream about a shared future. It invites people to co-construct and design the destiny of their organization. It is based on a positive and generative way of thinking that encourages creativity, improvisation, and collaboration.

Forgive my excitement for this new approach to organizational change, because I really am excited. A few years ago I encountered Appreciative Inquiry in an organizational change process, and I found myself stunned after I realized the potential it was able to release. I became curious about the way of thinking and by the positive revolution that apparently has evolved the last decades in the social sciences. This engaging approach to change inspired me to learn more about the possibilities that can be mobilized by using positive inquiry and appreciative approaches in leadership.

The past years I have explored Appreciative Inquiry with curiosity and in practice as a national board member of the Danish Guide and Scout Association with 26,000 members, where we have actively been using the approach for large scale change processes as well as in our choice of leadership style. My academic background is chemical engineering and product development, and this led me to draw the link between the two. I realized that product engineering would be an interesting field to explore through the lens of Appreciative Inquiry. My curiosity lead me to lots of questions about its potential in chemical product

development and finally into wanting to explore the subject even deeper.

This master thesis is an exploration of the potential of Appreciative Inquiry in chemical engineering. The focus is the possibilities of Appreciative Inquiry for chemical product development. During the project period I stayed three months in Cleveland, Ohio to explore as much as possible at the origins of Appreciative Inquiry at Case Western Reserve University. The master thesis has been conducted at Department of Management Engineering at the Technical University of Denmark.

1.1 What is My Curiosity About?

Appreciative Inquiry is a methodology that builds on the strengths and positive core of a subject when developing the future. In its nature it searches for the life-giving forces in organizations and strides to promote and expand the best of what already exists to bring the organization into the future. Instead of searching for problems to solve in the organization, Appreciative Inquiry searches for solutions that can render the problems irrelevant. This is an entirely different way of operating which shows its potential in human systems. A focus on previous success and shared hope for the future is often much more motivating than discussing the faults of the past and the problems of tomorrow. The appreciative approach touches people deeply because it invites for initiative, improvisation, and involvement which often leads to positive outcomes. The appreciative approach is therefore not only a change management methodology it is also a leadership philosophy that encourages positive changes in the entire organization. The potential that Appreciative Inquiry has shown by approaching problems and teamwork differently might also be valuable in engineering.

The core of chemical engineering has traditionally been chemical process technology. In this field there is a demand for good problem solving skills and high efficiency. During the past decade, there has been a shift in the focus of chemical engineering. The focus on processes has been substituted with a focus on products. The new field in chemical engineering is chemical product design. This field requires other skills; it requires creativity, cooperation, and effective solutions (Cussler and Moggridge, 2001). This means that there is a shift in the skills chemical engineers need and also in the processes and methods they should use. The field is calling for new ways to do product development.

Could Appreciative Inquiry be a valuable new approach in chemical engineering? Could it satisfy the new needs in chemical product development? The purpose of this master thesis is to uncover the potential in Appreciative Inquiry for the use in chemical product development. This implies a curiosity about Appreciative Inquiry and related approaches, a curiosity about the current processes of chemical product development, and a curiosity about how these fields can be synthesized into a new approach. The research task has therefore

been:

How can the principles of Appreciative Inquiry be used to create a process for chemical product development that creates better results than the conventional method?

This task is challenging and ambitious. It is not straight forward to introduce appreciative approaches in an industry which has traditionally been dominated by huge factories and mathematical modeling. The task requires a synthesis between intuitive skills represented by an involving leadership philosophy and factual skills represented by sound engineering. Although the approach has been theoretical the purpose of the task is practical, i.e. to create a practical model for chemical product development that builds on the appreciative principles.

The task is complex since the use of Appreciative Inquiry in organizations often leads to fundamental changes in the entire structure. A systematical approach has therefore been chosen as the way of exploring the potential of Appreciative Inquiry in chemical engineering. A simple framework of understanding organizations has been used; Leavitt's model of organizational subsystems (Leavitt, 1965). By using this framework it has been possible to both uncover a broad range of different perspectives but also to understand the possible impact of Appreciative Inquiry for the organization.

Leavitt (1965) defines organizations as open multivariable systems that consist of four subsystems; people, structure, task, and technology as shown on Figure 1.1. The subsystems are all interrelated and influence each other mutually. Each can be understood as a cluster of variables, and when one or more variables change the entire system may change. This model gives a useful approach for understanding the different perspectives to investigate on an organizational level.

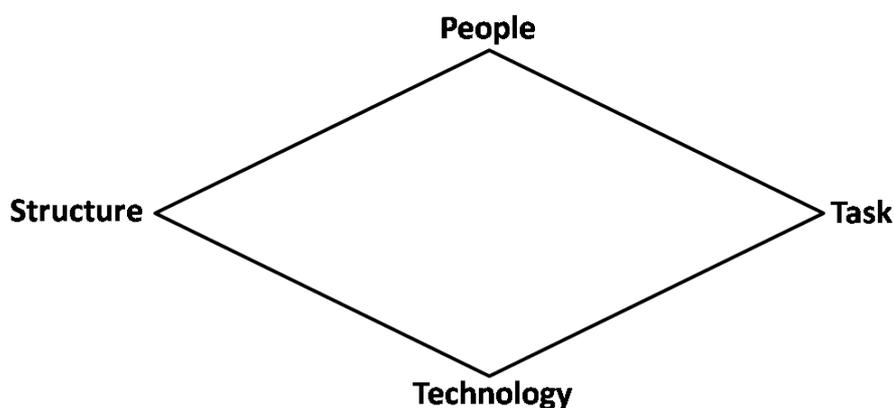


Figure 1.1: Leavitt's model of organizational subsystems (Leavitt, 1965).

Leavitt's model of organizational subsystems suggests that the four subsystems need to be balanced. This means that changes in one of them are likely to affect the others, and that

effective change needs to be carried out in all four subsystems. For this thesis it means that the effect of using Appreciative Inquiry should be investigated in relation to all four subsystems. It means that organizations should not introduce Appreciative Inquiry into the people subsystem without also considering introducing it into the structure subsystem and the technology subsystem. These four organizational subsystems will be the starting point for the journey into the *terra incognita* that this thesis has represented. The use of this model also creates a boundary for the task, i.e. what perspectives to investigate and what not to investigate. In the following the approach for investigation will be described for each subsystem.

1.1.1 People

During the past decades new perspectives has lead to a positive revolution in emerging fields such as Positive Psychology, Positive Organizational Scholarship, and Appreciative Inquiry. The fields are based on Social Constructionism and are recognized for seeking excellence, creativity, and strength rather than human deficits. For the organizations that have embraced these perspectives it has lead to large changes within the people subsystem. The investigation of this subsystem is concerned with understanding the perspectives of the positive revolution and social constructionism in order to use the knowledge later during the thesis. It is also concerned with understanding how Appreciative Inquiry can generate capacity and relations that improves the capabilities of the individual. The key questions to investigate in this subsystem are therefore:

- What are the implications of the positive revolution?
- How are the performance of people improved with these new perspectives?
- What does it mean to actively embrace Social Constructionism?
- How is Appreciative Inquiry effective in transforming organizations and its people?

1.1.2 Structure

The structures and processes that are embraced in an organization are in many ways defining the organization and its opportunities. The design of appreciative organizations has therefore been a central task for many leaders who have used Appreciative Inquiry. The investigation within this subsection is therefore concerned with uncovering the best practices around designing appreciative organizations, structures, and processes. This is particularly interesting in relation to chemical product engineering where there is a demand for integrating processes where the entire organization works together and involves external stakeholders. Another aspect to investigate is organizational processes. The main questions to investigate within this subsystem are:

-
- How can organizations be designed to embrace Appreciative Inquiry?
 - How can the appreciative approach be used to design appreciative organizational processes?
 - What perspectives are particularly interesting in relation to chemical product design?

1.1.3 Task

When organizations introduce the positive perspective into their work, it seems natural for many of them to reassess their task with a new mindset. This can be done by inviting the members to large strategic planning sessions that often lead to a new mission, vision, or strategy statement. The investigation within this subsystem is concerned with understanding how the appreciative perspective can influence the task, and also how the task can become meaningful to an appreciative organization. It is also concerned with how using the appreciative perspective can create new business opportunities and how chemical product engineering can take advantage of this. The key questions to investigate in this subsystem are:

- How does the use of Appreciative Inquiry influence the strategy and purpose of organizations?
- What business opportunities can be created by using the appreciative approach?
- How can chemical product development take advantage of these approaches?

1.1.4 Technology

Technology is the last of Leavitt's subsystems. It relates both to the technology that people use and in this context the technology that is being developed. Appreciative Inquiry has not yet been used more than very limited in the design of new technology. The investigation within this subsystem is therefore aimed at uncovering the current practices of conventional chemical product development. This includes an investigation of the field of chemical product development and the development processes and methods that are used. Central questions to uncover in this subsystem are therefore:

- How has the field of chemical product development changed during the past decades?
 - What overall processes are used for chemical product development?
 - What methods are encouraged during the development?
-

1.1.5 Applying Appreciative Inquiry in Chemical Engineering

The purpose of this master thesis is to discover how Appreciative Inquiry can be used in chemical engineering and to design applications for the approach. After the four subsystems have been investigated, the next step is to explore how the obtained knowledge can be used in chemical engineering. This will be done in two steps, first by introducing the concept of Appreciative Inquiry into the conventional process of chemical product development, and then by using the perspective to create a new appreciative approach to chemical product development.

In the following the outline of the report will be described and the methodology will be presented.

1.2 Scope and Outline

The purpose of this master thesis is to discover how Appreciative Inquiry can be used in chemical engineering. The aim is to introduce the concept to the conventional process of chemical product development and to create a new appreciative approach to chemical product development. This will be done by discovering and exploring four different organizational subsystems; its people, its structure, its task, and its technology. Herein, the concept of Appreciative Inquiry as well as its documented applications will be investigated by a thorough literature survey. The conventional process of chemical product development will also be described. The next part of the report offers suggestions on how to apply Appreciative Inquiry in chemical product development, first by introducing methods from Appreciative Inquiry into the conventional process, and secondly by designing a new method of chemical product development that is based on the appreciative approach. Finally, some future perspectives about the designed process are discussed. The main part of the report can be divided into two phases, the exploration phase and the design phase:

Exploration phase:

- People
- Structure
- Task
- Technology

Design phase:

- Appreciative Product Development
-

1.2.1 Methodology

This thesis concludes my studies as Master of Science and Engineering in Chemical and Biochemical Engineering, and is conducted at the Institute of Management Engineering at the Technical University of Denmark. This context means that it represents the perspective of engineering. The aim of the report is to introduce the appreciative approach to the field of engineering, and the following application of the knowledge is of primary significance.

The approach will deliberately be positively inquiring with a focus on finding potentials and uses for the theories. It will not be a constraining problem-solving approach that critically assess if the theories have been verified.

This master thesis is purely theoretically founded and most of the work and publications it is based on are quite recent. These two conditions represent some interesting challenges and opportunities for the methodology. Since there have not been any empirical studies involved in my work and since many of the publications and theories have not been empirically tested, the validity of much of the knowledge cannot be documented as engineers typically would. This means that the criteria for selection and accept of the theories for use in this report has not been made upon traditional scientific testing but based on their logical coherence with their basic assumptions. Because the aim of the thesis is application, the intention has been to be critical towards the theories, but not to scientifically document their validity.

Most of the theories used in this work are based on the theory of knowledge of Social Constructionism. To clarify, it is the version developed by Gergen and Gergen (2004) which states that reality is constructed in relations. By embracing this theory of knowledge it means that the logical coherence of the theories should be assessed in relation to Social Constructionism. It also means that positivistic arguments are not automatically accepted. It also means that the argumentation in much of the used literature is not positivistic and the scientific testing has been carried out with other assumptions than positivistic science is used to.

The exploring phase of the four organizational subsystems will be carried out by using scientific publications within the different fields to thoroughly investigate the areas. The design phase of introducing Appreciative Inquiry into the conventional process of chemical product development will be carried out by using the presented theories and deductive reasoning. The same approach will be used to design a new appreciative approach to chemical product development. Again the construction criteria will be logical coherence with the presented theories. An example of a construction criterion that will be used is whether the suggested process contains all the elements that are contained in the conventional process.

The constructed process will not be tested or validated empirically in this work. It can be tested in further research by applying it in the industry and comparing it to experiences with

the conventional process. The report will end with a discussion of the future perspectives and suggestions for how to build further on the work of this thesis.

1.3 Terminology

To clarify the terminology in the report a few important terms will be defined here. It should also be stated that many terms will be written with capital letters to clarify their use a specific term. This includes Appreciative Inquiry, Social Constructionism, etc.

Definition of terms:

Design. Design is used in different contexts in the report. Organizational Design is defined here as the process by which managers or organizational designers make specific organizing choices about task and job relationships that result in the construction of a particular organizational structure (Meyer et al., 2007).

Product Design is defined as the process of turning customer needs into a specified product concept.

Structure. Organizational Structure is defined here as the formal system of task and job reporting relationships that determines how employees use resources to achieve organizational goals (Meyer et al., 2007). It describes how tasks are differentiated and their outputs integrated. Organizational structure is the result of organizational design.

Process. An Organizational Process is defined as patterns of interaction, coordination, communication, and decision making that an organization uses to transform resources into customer value (Afuah, 2003). It can also represent patterns of interactions, coordination, communication, and decision making that indirectly lead to customer value.

Chemical process design is the task of devising and connecting unit operations that leads to the transformation of feedstocks into a desired product.

Method. A method is defined as a formal set of guidelines for how to perform a task. A process might consist of several methods.

Product Development. Product development is the process of developing a product from creating a concept to designing the production process.

The clarification of these terms concludes the introduction.

2

People: The Positive Revolution

“The ageless essence of leadership is to create an alignment of strengths in ways that make systems’ weaknesses irrelevant” - Peter Drucker

In every organization we want people excel in what they do. We want everybody to deliver great results and to realize their potential. We want them to thrive and develop while adding value to the core activities of the organization. We want to create excellent teams with great relations that really make a positive impact. The quotation by Peter Drucker tells the same story by focusing on the importance of building strengths rather than correcting weaknesses.

During the past decades there has been a shift in discourse about how to realize the dream of great results through great people that builds on the positive core that already exist. Where the strong scientific management approaches that Taylor introduced a century ago has really had a huge impact on industrial efficiency, its built-in assumptions about how to make people more efficient has lead to undesirable consequences (Karasek and Theorell, 1990). The new positive discourse in leadership and organizational scholarship has shown its potential in creating work environments, work relations, and empowering people in new ways. Appreciative Inquiry is an organizational change methodology that builds on this positive discourse. This positive perspective has been called the positive revolution due to the disruptive change in thinking.

The aim of this chapter is to describe the opportunities that the positive revolution gives people in organizations. This is done by investigating the most important fields in the

positive revolution as well as the theory behind. Herein, the methodology of Appreciative Inquiry will be described with a discussion of its implications for people in an organization. The exploration is also carried out to clarify the theory of Appreciative Inquiry and to understand how it can be used in chemical engineering. Therefore, many of the theories are quite thoroughly presented.

2.1 The Positive Revolution

During the past decades a new approach has emerged in the social sciences. Based on Peter Drucker's words, from the introduction of this chapter, the focus of the new approach is to make leadership focus on discovering and elevating strengths. Some call the new movement the strength revolution as it has profound implications for everyone who wants to lead with hope, optimism, and who wants to win the future through the highest engagement of human strengths. Others call it the positive revolution as it has been shown how powerful change can be when it builds on the positive core in organizations and focuses on all the strengths in human systems as well as positive emotions, words, images, inquiries, and constructions. The strong positive discourse calls for new tools for managers, change leaders, and designers, as they discover that Peter Drucker's words about making weaknesses irrelevant are actually true when moving past deficiencies, threats, breakdowns, and problems, and instead focusing on the desired future, aspirations, and human strengths.

The approach obviously seems sympathetic and desirable, but are these approaches really preferable compared to other approaches? Can it really improve organizational performance to shift perspectives? The next sections will argue how there is a significant difference. Some of the most important perspectives in the positive revolution are Positive Psychology, Positive Organizational Scholarship, and Appreciative Inquiry. In the following they will be described as well as their possible implications for the people in organizations.

2.1.1 Positive Psychology

Before World War II, psychology had three distinct missions: Curing mental illness, making the lives of all people more productive and fulfilling, and identifying and nurturing high talent. During the following 60 years most psychology research and practice changed its focus to pathology and curing mental illness. Psychologists changed their view on themselves to being a mere subfield of the health professions. They became victomologists and pathologizers, seeing human beings as passives where stimuli came on and elicited responses. They forgot that people make choices and decisions. Thus, the main job for the psychologist was to assess and cure individual suffering. This focus on repairing the wrongs led to forgetting

to seek for what makes people happy and well-functioning. This focus has changed with the emergence of Positive Psychology that again seeks the two other missions of psychology: Making people stronger and more productive, and making high human potential actual (Seligman and Csikszentmihalyi, 2000).

Instead of searching for curing mental illnesses the new approach of Positive Psychology searches for strengths to amplify, and how to create positive results. During the past ten years positive psychologists have revolutionized the field with strength-based research topics such as learned optimism, creativity, enjoyment, happiness, group well-being, work engagement, and innovativeness Peterson et al. (2008); Hakanen et al. (2008). A quotation by Albert Einstein describes the shift quite well: *“There are only two ways to live your life. One is as though nothing is a miracle. The other is as though everything is a miracle.”* Positive Psychology symbolizes a move to a more inspiring belief; that everything is a miracle and that we should focus on elevating human potential.

Seligman (2004) differentiates between three dimensions of living a happy life: The pleasant life, the good life, and the meaningful life. The pleasant life is based on positive emotions and experiences. The good life is based on engagement and arriving in the state of flow where time stops and you get fully devoted and engaged in a task or activity. The meaningful life is based on using your highest strengths and on belonging to something bigger than yourself. He states that productivity and health is a function of these three lives; of positive emotion, engagement, and meaning. And also, that the skills of happiness, the skills of the pleasant life, the skills of engagement, and the skills of meaning are different from the skills of relieving misery. This realization is a call for the new focus of Positive Psychology.

The flow state was first introduced by Csikszentmihalyi who during a research on creative people discovered that they can reach a completely engaging state of creation where time stops and they find themselves in a moment of ecstasy. In this flow state all the attention of the mind is focused on the activity and there is not any attention left to focus on the body, other situations, etc. The body and the identity disappear from the consciousness because all the attention is used for doing well at something that requires a lot of concentration. Some conditions of being in flow include: Being completely involved, focused, and concentrated on the activity. Being in a sense of ecstasy of being outside everyday reality. Having a great inner clarity of knowing what needs to be done and how well it is going. Having a sense of serenity without worries of oneself, and a feeling of growing beyond the boundaries of the ego. Feeling timelessness being thoroughly focused on the present while hours seem to pass by in minutes. Having intrinsic motivation, feeling that whatever produces the flow becomes its own reward (Nakamura and Csikszentmihalyi, 2002; Csikszentmihalyi, 2004).

Reaching flow is a function of skills and challenges as shown in Figure 2.1. A key characteristic of the flow model is interactionism. Rather than focusing on the person alone, flow research emphasizes on the dynamical system composed of person and environment.

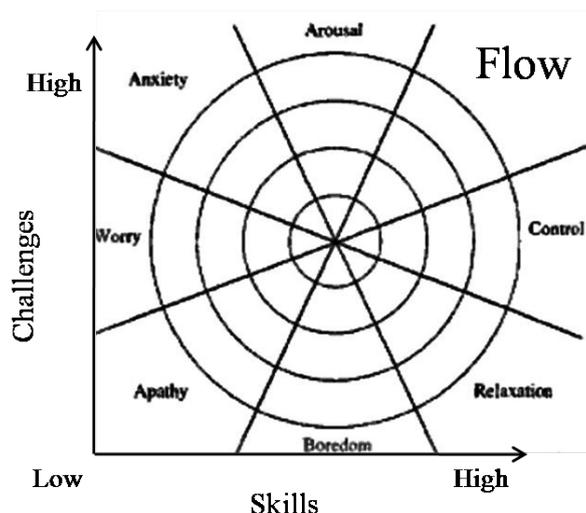


Figure 2.1: Flow requires high skill level as well as high challenges (Nakamura and Csikszentmihalyi, 2002).

The flow state makes people focus and deliver their best and it fosters growth and development. When people master challenges in an activity they develop greater levels of skill. Then, even higher challenges are required to continue to experiencing flow (Nakamura and Csikszentmihalyi, 2002).

Positive Psychology has a lot of things to contribute with in order to make people excel in what they do. Another example of a research field within the domain of positive psychology is the field of creativity. Tanggaard (2008) has carried out research on how to enhance creativity and suggests for example the following ways:

- Accept dynamical and inspirational challenges.
- Make room for questions and to not follow the rules.
- Freedom to test new ideas, alternatives, and possibilities.
- Set time aside to discuss ideas.
- Support of ideas in an accepting discussion climate.
- Open and supportive climate where it is possible to show ideas without the fear of reprisal.
- Playfulness and humor.
- Risk willingness.
- Dynamics and freedom to change the curriculum.

2.1.2 Positive Organizational Scholarship

Positive Organizational Scholarship focuses on the dynamics leading to the development and fostering of human strength, resilience, vitality, and extraordinary individual and orga-

nizational performance. Cameron and Caza (2004) defines it as: The study of that which is positive, flourishing, and life-giving in organizations. Positive refers to the elevating processes and outcomes in organizations. Organizational refers to the interpersonal and structural dynamics activated in and through organizations with focus on the context in which positive phenomena occur. Scholarship refers to the scientific and theoretically derived investigation (Cameron and Caza, 2004).

Positive Organizational Scholarship and its related fields are promoting that much can be gained from utilizing approaches that give insights into both the positive strengths and the negative weaknesses, and by knowing the interactions between and limitations of each of them. They are not asking for ignoring weaknesses and being overly optimistic. Too much positivity such as overconfidence can hinder performance, unrealistic optimism can lead to evasion of responsibility or group think, and false hope can lead to pursuit of ineffective goals and poor allocation of resources. Instead, these fields have identified that remarkable rewards can be found in the strengths that lie in the previously under-developed domain of positive organizational scholarship (Luthans and Youssef, 2007). Building on the knowledge from Positive Psychology that the absence of psychopathology does not explain optimal functioning, excellence, growth, flourishing, and fulfillment, positive organizational scholarship does not search for weaknesses to repair but instead it promotes a search for the desired. According to Luthans and Youssef (2007) the positively oriented human traits, states, organizations, and behaviors may have a substantial positive impact on performance and other desired outcomes beyond what classical business models and deficit-oriented approaches can offer.

Domains within Positive Organizational Scholarship include: Organizational Virtuousness, Positive Leadership, Positive Identity, and Positive Social Capital. Organizational Virtuousness is concerned with the attributes characterizing the best in human condition such as what virtues are associated with flourishing at work. Positive Identity is concerned with how individuals and collectives build a sense of who they are that cultivates optimal functioning. Positive Leadership is concerned with empowering people to a state of leadership that attract and lift other people to higher levels of performance. Positive Social Capital is concerned with examining the field of social capital with a positive organizational scholarship lens seeking to expand the generative capacity of people and groups, making people grow, thrive, and flourish in organizations and thereby achieving their goals in new and better ways. Ways of increasing this include high-quality connections and energy networks (Center for Positive Organizational Scholarship, 2009).

Table 2.1: A Deviance Continuum of Individual and Organizational Aspects (Cameron, 2003).

	Negative Deviance	Neutral Deviance	Positive Deviance
Individual:			
Physiological	Illness	Health	Vitality
Psychological	Illness	Health	Flow
Organizational:			
Economics	Unprofitable	Profitable	Generous
Effectiveness	Ineffective	Effective	Excellent
Efficiency	Inefficient	Efficient	Extraordinary
Quality	Error-prone	Reliable	Perfect
Ethics	Unethical	Ethical	Benevolent
Relationships	Harmful	Helpful	Honoring
Adaption	Threat-rigidity	Coping	Flourishing
Orientation:	Problem solving		Virtuousness

2.1.3 Positive and Appreciative Leadership

The fields of Positive Organizational Scholarship and Appreciative Inquiry have inspired to the formation of new leadership philosophies based on the same strength based methods. They will briefly be introduced here.

Positive Leadership. Positive Leadership is based on the assumption that positive deviance can bring forth life and extraordinary results. A deviance continuum is shown in Table 2.1 of some individual and organizational aspects. Most organizations and leaders are fostered to create stability and therefore focus on maintaining performance at the center of the continuum. Success is often defined as efficient performance at this non-deviance position. For example, in the case of psychological work environment, the focus during the past decades has been to eliminate high strain work because it was found to lead to serious illness. The focus in Positive Leadership would instead be to enable a positive psychological work environment. The research of Karasek and Theorell (1990) actually shows that it is not work strain and job demand alone that leads to illness. It is only when job control is not equally present. So when the traditional problem solving would remove the conditions that made the people ill, a positive approach would instead enable the conditions of job control that could make the psychological work environment flourishing with people in flow. According to Karasek and Theorell (1990) the latter situation with high demand and high decision control leads to enhanced active learning, motivation, and the reinforcement of new behavioral patterns.

A focus on weaknesses or deficiencies only leads to the development of competence, i.e. only to non deviance. Whereas a focus on strengths can lead to excellent and positively deviant performance (Cameron, 2008). Positive leadership is therefore focused on creating positive

deviance in organizations in order to create extraordinary performance. Four interrelated leadership strategies that enable positive deviance are presented by Cameron (2008) as shown in Figure 2.2.

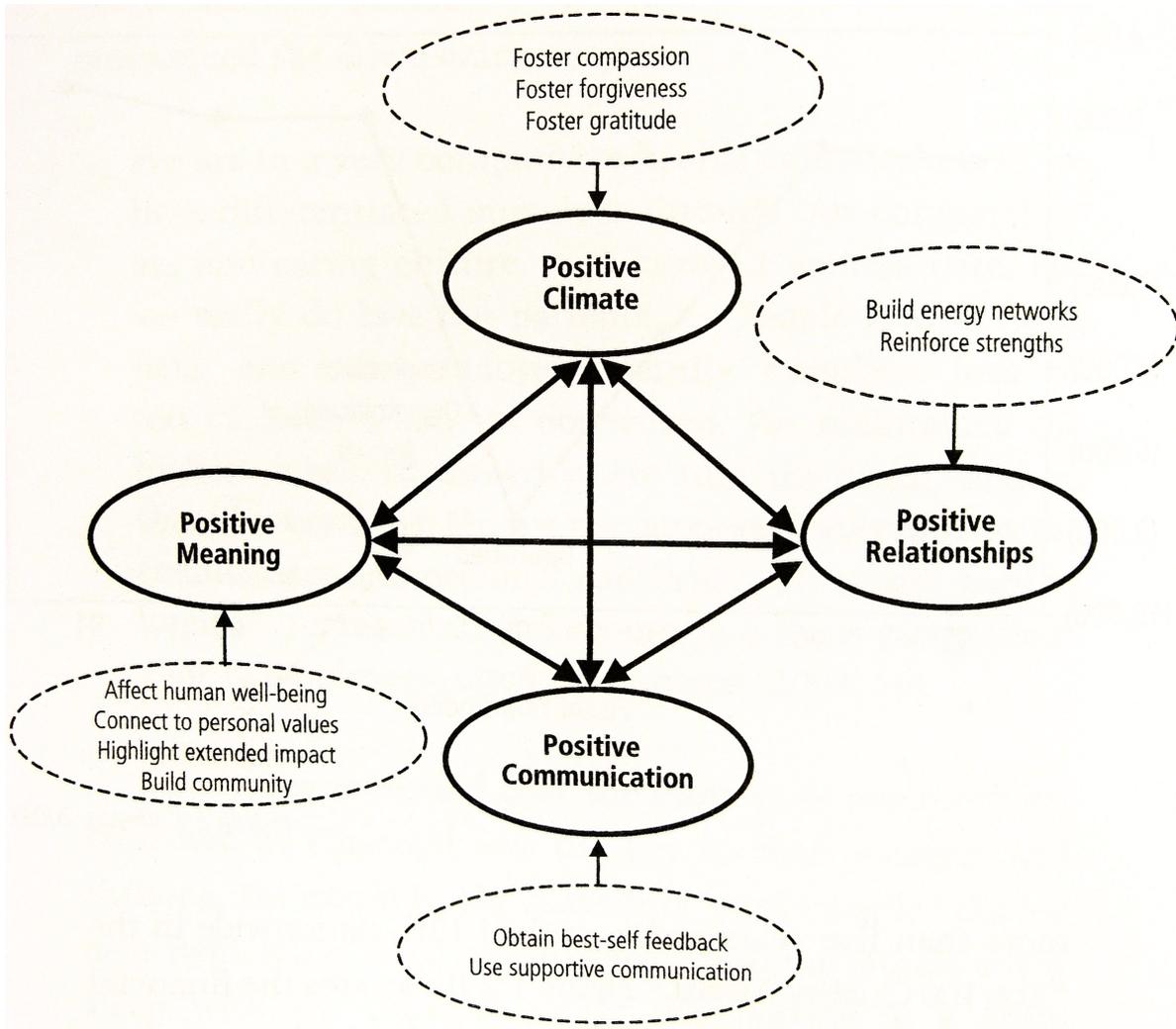


Figure 2.2: Four strategies that enable positive deviance (Cameron, 2008).

Positive climate. Keywords in enabling a positive climate are compassion, forgiveness, and gratitude. A positive work climate where people are cared for, supported, and encouraged to flourish can be a strategy to create positive deviance.

Positive relationships. Positive relationships are found to generate enrichment, vitality, and learning. Groups with positive relationships have been found to outperform other groups in decision making and motor tasks (Cameron, 2008). A way to enable positive relationships is to create positive energy networks. It has been found that some individuals can be identified as positive energizers to others. They uplift, boost, motivate, and give energy to other people. Positive energizers are optimistic, heedful, trustworthy, and unselfish. They benefit the organization by enabling others to perform better, and it has been found that

being a positive energizer is a far more predictive for success than being in the center of an information or influential network (Baker et al., 2003). Positive energizing is a learned behavior and interaction with other positive energizers can help the development of these skills. Placing positive energizers in central positions that allow others to interact with them is a good strategy for creating positive relationships. It should be noted that not everyone is a positive energizer for everyone else, and this should be taken into account. What to do with negative energizers should also be taken into considerations. A second opportunity for leaders to promote positive relations is to reinforce organizational and individual strengths. This can be done by focusing on role-modeling of positive energy and strengths that provide opportunities for other positive energizers to infuse members with their enthusiasm (Cameron, 2008).

Positive communication. Positive communication occurs when supportive and affirmative language replaces negative and critical language. The most important factor in a study of organizational performance was the ratio of positive statements to negative statements (Cameron, 2008). In high-performing teams the ratio was 5.6 to 1. This means that positive statements dominated over negative statements, but there was still room for critical and negative information. The second result was that the high performing teams had a much higher ratio between inquiring comments and advocacy statements. They had more than one inquiring comment for each advocacy statement. Low performing teams has 5 inquiries for 100 advocacy statements. The third result was that high performing teams have a much higher connectivity than the other teams. Ways to enable positive communication is through practice, e.g. by using a method of positive feedback called the reflected best-self feedback process developed by Roberts et al. (2005). It a personal exercise based on getting positive feedback from numerous contacts that has to describe situations when the focus person has excelled. The focus person then uses the narratives to create a best self portrait. This technique strengthens relationships between feedback providers and receivers, it fosters positive interactions and reciprocal feedback, and positive energy to pursuit personal development, and in the meanwhile everybody has practiced positive communication. Another means to enable positive deviance through positive communication is by the use of supportive language. This type of communication seeks to preserve or enhance a positive relationship while still addressing a problematic or uncomfortable issue or giving negative feedback. Cameron (2008) suggests doing this by using descriptive communication rather than evaluating communication. This method consist of describing the situation rather than evaluating it, identifying objective consequences or personal feelings rather than placing blame, and suggesting acceptable alternatives rather than arguing who is right or wrong. This leads to a constructive conversation that emphasizes collaboration rather than arguing and judging.

Positive meaning. The fourth strategy for creating positive deviance is to create positive

meaning. Studies suggest that high meaningfulness in work is associated with positive outcomes and extraordinary individual and organizational performance. The meaningfulness is not just depending on the type of work but rather on the interpretation of the positive meaning inherent in the work. Work can be associated with meaningfulness by possessing one or more of the following attributes: Important positive impact on the well-being of human beings, association with important virtue or personal value, impact that extends beyond the immediate time frame and ripple effect, and it builds supportive relationships or a sense of community in people. The leadership task is to help identifying where the work can be associated with positive meaning (Cameron, 2008).

Appreciative Leadership. Another leadership perspective that is closely related to this is Appreciative Leadership. The word appreciation in this context means to value and recognize the best in people and the world around, to affirm the past and present strengths and potentials, to perceive those things that give life to living systems, and to increase in value. Appreciative Leadership is to believe that everybody is acting in ways that makes sense for them in their context. This means that whenever somebody acts strangely or even unreasonably the appreciative approach is to think “in what context would this action make perfect sense?” When recognizing and believing that a person’s actions are meaningful this leads to seeing the person as an equal and appreciating all the resources, ideas, and thoughts that the person has. Appreciative Leadership is to see, listen to, and hearing other people. It is to meet other people as competent people that want and can contribute constructively. It is to set own understandings and values aside for a while to listen to others’. It is to stop assessing and valuing other people and instead recognize them as engaged, competent, excited, and thinking just as ourselves (Haslebo and Lyndgaard, 2008b).

Another aspect of Appreciative Leadership is exploration, discovery and inquiry. This means to be open and curious about discovering. It means to be ready to ask questions and be open to new potentials and possibilities. Appreciation without curiosity becomes praise, but this does not inspire to further knowledge. Exploration and inquiry inspires to development. Inquiry is not the same as investigation and analysis. These two terms are important in the scientific world but Appreciative Leadership encourages another approach to get answers. Instead of investigating and analyze cause and effect the appreciative approach instead explores how to obtain a desired state. Inquiry is basically about playing with many different hypotheses and possibilities, curiosity, open-mindedness, accept of complexity, and about handling change. Technically, inquiry is about asking questions. The questions in Appreciative Leadership are focused on success, resources, positive expectations, etc.

The coupling between appreciation and inquiry in Appreciative Leadership is shown in Figure 2.3 that shows four different leadership modes.

Haslebo and Lyndgaard (2008b) present some basic assumptions behind Appreciative Leadership:

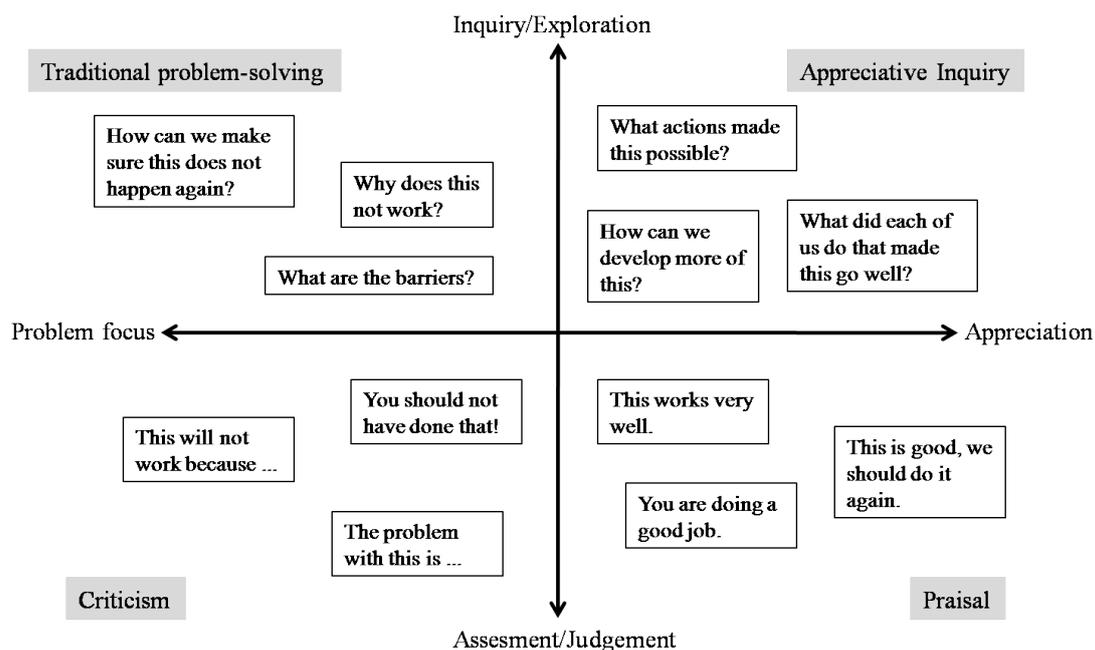


Figure 2.3: Four leadership modes of traditional problem solving, appreciative inquiry, criticism, and praisal (translated from Haslebo and Lyndgaard (2008b)).

- Organizations are living systems and leadership is about relations.
- In every organization and team something works well.
- What we focus on becomes our reality.
- The language we use creates our reality, our past, present, and future.
- People have different parallel perceptions of reality.
- Differences are important and valuable to the organization.
- People are more comfortable with the future if they can bring something from the past.
- It is better to realize wishes than to remove problems.

Later in this chapter Appreciative Inquiry will be thoroughly described.

An important assumption in both Positive Leadership and Appreciative Leadership is a positive view of human nature. In both perspectives it is assumed that every person is interested in contributing and creating value when invited. People want to perform well and do this best when they flourish in positive processes and environments. The leadership task is to create possibilities for everybody to deliver excellent results.

The theoretical foundation that Positive Psychology, Positive Organizational Scholarship, and Appreciative Inquiry are based on is Social Constructionism. Without going into the discussion about epistemology the practical implications of Social Constructionism for people in organizations will be discussed in the next chapter.

2.2 Social Constructionism

The theoretical basis for the positive revolution is Social Constructionism, a sociological theory of knowledge that considers how social phenomena develop in social contexts. In this section, implications and possibilities that come from using this theoretical approach will be introduced. Also, it will give insights into how the positive revolution works.

Gergen and Gergen (2004) describes Social Constructionism as the simple idea that our understanding of the world around us is constructed, and that the construction is created under the influence of our relations with other people. A simple example can elaborate further on this: When adults look around and see a car, they might notice it's a BMW and that the house next door is old. A one-year-old child might not even recognize the car or the house, nor if the people around are men or women. The things that are seen may not be different, but the meanings might. The interpretations depend on the Social Constructions that are based on our relations. This does not mean that nothing is real or that nothing exists. It means that people speak from a cultural tradition when they define what reality is and how to interpret the world around them. This implies that there is no objective reality because different perspectives can change the subjective realities of different people. There is no single objective Truth but instead several subjective truths. The practical implications of Social Constructionism are quite useful, as they invite practitioners to use new interventions and question reality in new ways. The potential shows itself when well established constructions are challenged with the purpose of opening up for new possibilities, e.g. when problems are re-formulated into hidden possibilities and when actions no longer are limited by something that traditionally has been considered true, rational, or right. Ahead of the thoughts of Social Constructionism lies a large spectrum of possibilities for new action. This does not mean that everything that is considered real or good should be abandoned but it means that we are not bound by the fetters of history or tradition and that every situation can be re-constructed into a more useful situation. When people talk, listen, ask questions and consider new possibilities they move towards continuously creating a new world, and the future is created in relations (Gergen and Gergen, 2004).

According to Social Constructionism consciousness is born in relations and in dialogue. This means that the importance of the language is stressed. Since this epistemology is based on relations rather than individuals, the language is important since it is an important way to develop and mutually influence relations. When realities are constructed in different traditions it becomes obvious that the use of some words instead of others can often open up new possibilities. Language is only one component of action: non-verbal and extra verbal communication are important in construction realities, as well as actions. Performative actions are components of relational progress and the context becomes important for the meaning of the words and actions. This means that all of these subjects are fair game when

designing interventions to actively use Social Constructionism for a purpose.

Social Constructionism can be hard to understand and acknowledge because of its contradiction to the tradition we are all familiar with. The school system, our language, and technology are all mostly based on realism rather than Constructionism. It challenges well established and successful paradigms by interpreting them in new ways. Most sciences would be understood differently through the glasses of Social Constructionism. Most scientists believe that a real and tangible world that exists independently of people can be discovered by scientific methods and equipment. Social Constructionism does not downgrade the value of science but it questions whether it is actually the Truth that is being discovered or rather if it is constructing a new tradition of interpreting the world. Social Constructionism has been criticized for undermining all beliefs when history, politics, and even science are only narratives. It is criticized for leaving a nihilistic view behind where nothing is real. Gergen and Gergen (2004) answers that social constructionists have sympathy for the desire to have tangible realities, and a desire to know right from wrong, e.g. to know whether the doctor can cure the disease and the pilot land the plane. Social Constructionism does not want to leave truth; but instead wants to recognize different kinds of truth in different perspectives and contexts.

In the context of this work, Social Constructionism opens up new possibilities that can be discovered and used actively. Good examples of this are Appreciative Inquiry, and many of the other positive approaches that have been developed from the development of Social Constructionism. Successful use comes when assumptions are challenged and replaced with something better. This is what happens when leadership moves from the picture of the grand old man of leadership into relational leadership, and when knowledge moves from the individual intelligence of Einstein into the collective intelligence of Wikipedia. The possibilities are endless and they are continuously being developed.

The use of Social Constructionism is particularly useful in an organizational context because organizations are constructed by people and therefore can be re-constructed. When using Social Constructionism in technology and natural science it should not be used to question reality, but rather to question the interpretations of analyses and results. There is much ambiguity in natural science, and a perspective through Social Constructionism might open up for new interpretations and results.

In the following some practical implications from Social Constructionism will be described. These include practical application of systemic thinking, the narrative approach, and some general assumptions that come with Social Constructionism.

2.2.1 Systemic Thinking

Systems theory is an interdisciplinary theory about the nature of complex systems. Building on Social Constructionism, a branch of systems theory has been developed into an approach to organizational development. Referred to as Systemic Thinking it offers valuable insights into how to handle complex systems such as organizations. In systems thinking, the smallest units in the understanding of the world are not individuals but relations, and the language is active in creating relations (Bjerring and Lindén, 2009). Methods based on Systemic Thinking have also been used as engineering tools to approach complex issues (Vanasupa et al., 2008). Some important assumptions in Systemic Thinking in an organizational context are described in the following:

Autopoiesis and Multiverses. Every individual creates his own version of reality, a personal system. Whenever the system gets input from outside sources, the information is filtered based on knowledge, earlier experiences, etc. Meaningful information is thereby allowed into the systems and non-meaningful information is ignored. This means that every individual creates a personal reality and that a larger system consisting of several individuals then consists of multiverses rather than a single universe. Objectivity ceases to exist and is substituted with a multitude of subjectivities. This assumption is termed Autopoiesis from the greek words auto and poiesis, meaning self and creation. A social system is based on the recurrent interactions between the same autopoietic systems (Maturana and Varela, 1980). In an organizational context this realization about individuals' perceptions of reality means that interventions should take into account the different perspectives, and also that autopoietic systems are protecting themselves and need to be challenged to develop (Bjerring and Lindén, 2009).

Context. Communication always happens inside a meaning-carrying framework. The content of communication can only be understood by understanding the frame and context it is part of. All information must therefore be seen in context to be meaningful, and when the context changes, the interpretation of actions changes as well. The context gives the participants in a situation a common understanding about what is desirable in the situation. Different people bring different contexts into the situation and a common context is created in dialogue. By investigating questions on a meta-level it is often obvious that when the context is unclear it is difficult for people to give useful answers to the questions (Bateson in Hornstrup and Storch, 2006; Tognetti, 2002)).

Meaning and Action are Interrelated. Through communication both meaning and action are carried out. The content of communication and the used methods for communication shape the relations as well advocates for action. This means that the action and meaning that are produced by communication should be coordinated (Pearce and Pearce, 2000).

Questions Create the Arena for Answers. For a systemic practitioner the most useful

tools are questions. The questions asked will determine the answers given. Instead of only asking questions that search for cause and effect, systemic questions are often searching for circular relations between people and elements. Karl Tomm has described four different types of questions and their implications (Hornstrup and Storch, 2006):

- Lineal questions that are intended to clarify sequences of events over time as well as cause and effect.
- Circular questions that are intended to generate contextual understanding for the interviewer as well as patterns of interaction in relationships.
- Reflexive questions that are intended to influence respectively and open space for alternative meanings.
- Strategic questions that are intended to influence correctively by leading questions as well as confrontation questions .

Language creates reality. The prerequisites of the actual construction of social reality are messages within relations. The paramount creator of messages is the language, and the paramount creator of relations is the message. The language we use therefore defines the constructed reality (Wittgenstein, 1994).

The Heliotropic Principle. Just as sunflowers turn their heads into the sun, people tend to turn towards the pleasant and likable when they have the opportunity. There is an observable tendency for human systems to evolve and move in the direction of the images that are the brightest and most promising. People thrive in positive environments and they should therefore be preferable for social systems (Cooperrider et al., 2008e).

2.2.2 Implications for People and Relations

Haslebo and Haslebo (2007) describes eight basic assumptions in Social Constructionism that are relevant in an organizational context for the people and relations. They also use the narrative approach that creates meaning through narratives.

Members of an organization construct their reality through the language they use. In the social constructionist perspective it is not possible to describe an organization unambiguously as it really is. Instead there exists a diversity of different versions of reality that are created in the language. The interesting question is not how an organization, a situation, or a problem can be described but rather how the members of the organization create their understandings that guide their actions. The focus is therefore how realization is created, recreated, and reformed in organizations, and how change can happen by changing the language in the organization.

An organization can be understood as an arena of changing communities of practice. Every leader and employee is member of several communities of practice within and outside the organization. Every community can be seen as a relational network consisting of actors that communicate with each other and thereby create a common understanding of the organization. Instead of thinking about the organization as a stable unity that can be described with numbers, organizational charts, etc.; the social constructionist perspective encourages thinking about dynamically changing communities of practice where the members of the organization sign in and out as time goes by, and where the themes inside the communities of practice also change.

Discourses and narratives adapt the organization's members' personal experiences into a holistic understanding. In the social constructionist perspective, our understanding of ourselves in relation to others is basically organized as narratives. Fragments of speech, impressions, or experiences do not have a meaning in themselves but get meaning when they come into context depending on what narratives they get incorporated into. The organization of experiences into a narrative thereby creates a holistic understanding of the events that happen over time. In organizations, leaders and employees create meaning in their working life and their relations to others through the language and the stories they tell.

An organization member forms different "selves" through the different relations and communities of practice. In a social constructionist perspective, a person's self-perception and identity is a relational phenomenon incorporated in organizational members' narratives. Every person has access to several stories about himself. The choice of which stories to tell, where, and when is influenced by which communities of practice the person is included in. This means that several "selves" and ways to understand oneself is attached to every person. An important point is that we are all co-creators of each other. The actions we do as members of an organization not only influence our own work situation but also how our own and others' identities and perceptions of themselves are formed.

Ethics and morality are embedded in language, discourses, and narratives. A narrative is, in a social constructionist perspective, not only about how reality is, but also how reality should be. Communities of practice in the organization are kept together by matching versions of reality and a common morality. Leaders, employees and consultants have choices of participation in the stories that are told in the organization. There are choices about which stories to listen to, which stories to keep alive, and which new stories to create. The narratives that we tell and the narratives we listen to are creating the social world we are a part of.

Power is the ability to define truth and define the boundaries for choice. In a social constructionist perspective, power is the possibility to define reality and to decide what true knowledge is. These possibilities are not equally shared among everyone. This unequal division of power to position oneself and others in the narratives that are told is important

for the terms that are associated with leaders and employees and on the possibilities and limitations that are established for each member of the organization.

Appreciative Inquiry is a way to new realization about a desirable future. The idea behind Appreciative Inquiry is that there is more energy and direction in focusing on the thoughts, actions, events, and interaction patterns that enhance movement toward a desirable future. In every organization there is something that works. It is rewarding to be curious about what works. Exploration of events in organizations should focus on looking for, describing, and explaining all the facets of thoughts and actions that create life and energy, and that show the competences and engagement of leaders and employees.

Choice of Social Constructionism as theory of knowledge implies an ethical responsibility. A social constructionist perspective on events in organizations means an increased focus on relational ethics and thereby implies an ethical responsibility. The most important responsibilities according to Haslebo and Haslebo (2007) are:

- To keep a reflecting doubt alive and to have a curiously inquiring mental position. This implies exploring how assumptions, choice of terms, and language are creating our reality.
- To improve the ability to look at organization members in an appreciating view and listening non-judgmentally while searching for competencies, useful experiences and wise considerations.
- To allow and give room for a diversity of stories including the non-dominating. This builds on a democratic value system that challenges to create methods that make it possible for involved leaders and employees to get a voice and a chance for being heard and understood.
- To use an appreciative language. Terms and language are tools for building relations and therefore communication should be based on language that strengthens the interrelated connections in organizations that enhances the members' desire for communication with and learning from each other.

In this section some practical implications of Social Constructionism have been discussed. In the following section Appreciative Inquiry will be introduced.

2.3 Appreciative Inquiry

Appreciative Inquiry (AI) is a methodology for positive change. It is an organizational development process and approach to change management which is grown out of Social Constructionist thought. Through its deliberately positive assumptions about people, organizations, and relationships, it leaves traditional deficit problem solving approaches behind.

The methodology may be applied to whole organizations, departments, or teams, and has traditionally been used for organizational learning and transformation. A quotation by Cooperrider (2007) the founder of Appreciative Inquiry describes a central idea behind the methodology: *“We create our organizations based on our anticipations of the future. The image of the future guides the current behavior of any system.”* This stresses the power hope and aspiration among people can have for the future results. Another assumption behind AI can be described as follows (Cooperrider et al., 2008e): *“Every organization has something that works right - things that give it life when it is most alive, effective, successful, and connected in healthy ways to its stakeholders and communities. AI begins by identifying what is positive and connecting to it in ways that heighten energy, vision, and action for change.”* The authors state that this illustrates how Appreciative Inquiry is an adventure for organizations into how people can flourish and build better working relations and be enabled to success. They state it is a proven paradigm for accelerated organizational learning and transformation (Cooperrider et al., 2008e). It can be used in any situation where leaders and organizational members are committed to building positive and life centered organizations. Mentionable ways it has been used include (Cooperrider et al., 2008e):

- Strategic planning
- Collaborative partnerships and joint ventures
- Leadership development
- Team development
- Organizational innovation
- Work process redesign

In the following the principles and assumptions behind Appreciative Inquiry will be presented in order to understand the fundamental methodology as well as critically to investigate how it works and under what conditions it works.

2.3.1 Principles and Assumptions behind Appreciative Inquiry

Cooperrider et al. (2008f) defines the two words that AI consists of as follows: *Appreciative* means to value, recognize the best in people and the world, and to affirm past and present strengths, successes, and potentials. It means to perceive those things that give life to living systems, and to increase in value. Its synonyms are value, prize, esteem, and honor. *Inquire* means to explore and discover, to ask questions, and to be open to seeing new potentials and possibilities. Its synonyms are discover, search, systematically explore, and study.

Appreciative Inquiry is based on the assumption that in every organization something works well and those strengths can be the starting point for creating positive change. By inviting

people to participate in sharing stories about their past achievements, strengths, assets, opportunities, visions, etc., a positive core for the organization can be identified. AI links the energy from the positive core to a change agenda, bringing energy, excitement, and a desire to move toward a shared dream. Note the similarities in the assumptions with other social constructionist perspectives' assumptions.

AI is based on the following assumptions (Hornstrup and Storch, 2006; Cooperrider et al., 2008f):

- In every organization something works.
- What we focus on becomes our reality.
- Reality is created by people and multiple realities exist.
- People are more comfortable by traveling into the future (unknown) if they bring something from the past (well-known).
- If we have to bring something from the past it should be the best.
- It is important to value diversity.
- The language we use creates our reality.
- The organization is not seen as a problem to be solved but as a mystery to embrace.

These assumptions show that AI is based on several social constructionist and systemic thoughts (Hornstrup and Storch, 2006). Four principles can be extracted from these assumptions.

Organizations are Social Constructions. Organizations are created by people as a social construction. The inter-personal communication and relations are what creates the foundation for the organization. The total knowledge and experiences of the people is the most important resource for the organization, and the ability for it to evolve and develop depends on the human resources and knowledge. To create constructive change in the organization the creativity and ability to innovate must be enabled.

Our Expectations Create the Future. The mental models and expectations for the future are determining the current and future actions. Creativity plays an important role in creating new ways of shaping the future, and the ability for an organization of creating future possibilities depends on the ability to enable this sum of creativity. Through shared positive innovation processes, shared mental models can be created about the future. This is the prerequisite for joint action. It is important to generate new expectations and actions to create change.

Analysis and Implementation Happen Simultaneously. Inquiry cannot be carried out without influencing the social system, and the way inquiry happens therefore has a large

impact on the system. The questions and subjects that are investigated are increasingly important from this perspective.

The Positive Approach has a Larger Potential. By focusing on the positive the change, potential is much larger when using the participants' positive experiences and wishes as the starting point. This means that a focus on the positive experiences in the organization and its creativity can produce a much more innovative foundation for its future.

In order to carry out these principles a few competencies should therefore be developed and used according to Hornstrup and Storch (2006). The first is the competency to focus on and maintain the positive experiences of the organization. This means not only to learn from mistakes but also to learn from success. This not only uncovers a great deal of often un-utilized knowledge but often also releases much positive energy among the people. The second is the competency to move past the natural boundaries and limits that are present. This implies that development processes should be open with room for provoking decisions, habits and routines. The third is the competency to generate new knowledge and ideas. This is of central importance in organizations, and another aspect of this is that people should be able to see themselves and the consequences of their actions in a larger context. This can enable constructive knowledge and creativity to be enabled in all sorts of contexts. The fourth competency is to create time and space for the AI process where it can grow and evolve. This means that dialogue across departments, functions, and levels should be created.

Cooperrider et al. (2008f) describes four underlying propositions of Appreciative Inquiry that has lead to the development of the AI basis method the 4-D Cycle, as shown on Figure 2.4.

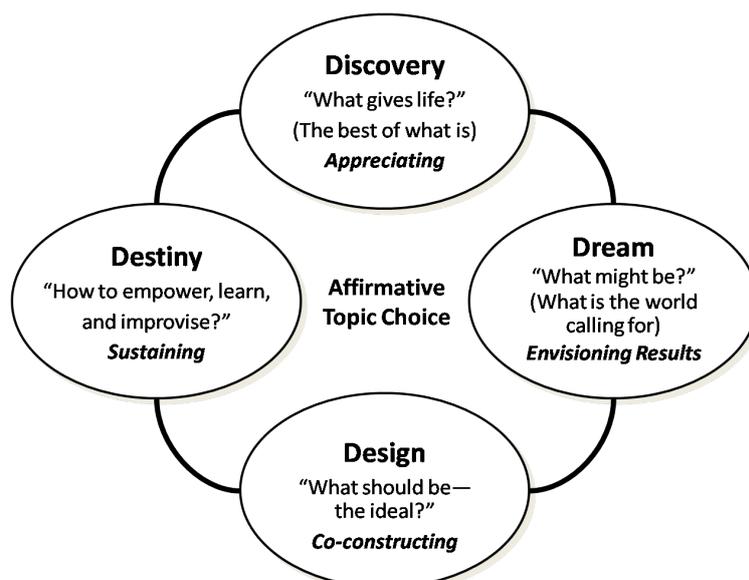


Figure 2.4: 4-D cycle of Appreciative Inquiry (Cooperrider et al., 2008f).

Inquiry into Organizational Life should begin with Appreciation. Because every system works to some degree the primary task for management and organizational analysis is to discover, describe, and explain the exceptional moments that activate people's energy and competencies and give life to the system. This phase is a search for the best of "what is" and is termed the Discovery phase.

Inquiry should yield applicable information. Organizational inquiry into what is possible should lead to the generation of knowledge that can be used in action.

Inquiry into the best possible should be provocative. An organization always has the capability to become more than it is, and learning is always possible. It should take active part in guiding its own evolution by searching for something that generates action.

Inquiry into human potential in organizational life should be collaborative. The more people who are involved in a change initiative, the larger impact and momentum it can obtain from the positive core. People who have been a part of an inquiry do not have to get the information about the change later on, and this advantage is widely used in AI interventions.

The Discovery phase which seeks the best of "what is" is often guided by questions such as "*what, in this particular setting and context, gives life to this system - when it is most alive, healthy, and symbiotically related to its various communities?*" (Cooperrider et al., 2008f). A key method in the discovery phase is the appreciative interview that seeks to explore what gives life. The following phase in the 4-D Cycle is the Dream phase which is based on questions such as what the possibilities are for even more effective forms of organizing. In Appreciative Inquiry the best of "what is" is used to ignite and energize the Dream phase into a collective imagination of "what might be". The aim is to create a dream about a shared vision for the future that can successfully translate images into possibilities, intentions into reality, and beliefs into practice (Cooperrider et al., 2008f).

The third phase of the 4-D Cycle is the Design phase where the dreams are used to co-construct the future by designing an organizational architecture that enables the exceptional in the daily work. It should create provocative and generating statements of intentions which combine the experiences from the past with new ideas envisioned for the future. The Design phase is concerned with turning "what might be" into "how can it be".

The fourth phase in the cycle is the Destiny phase which is about "what will be". The phase is about delivering the designed propositions and making them real for the organization.

In many versions of the Appreciative Inquiry cycle a preliminary phase is included, i.e. the Definition phase. In this phase the subject of the intervention is defined in a way that appeals for action. The specifics about Appreciative Inquiry will be described later in this report when it is discussed more in practice.

2.3.2 Generativity in Appreciative Inquiry

The positive approach that Appreciative Inquiry incorporates is not the most important factor for its success. Bushe (2010) suggests that its generative capacity is much more important for it to work effectively. The work by Gergen (1978) demonstrated that normal scientific assumptions could not be successfully applied to studying human societies and achieving the scientific values of prediction and control were not possible in social psychology. The claim was that instead the aim should be to create a social science which focuses on its generative capacity. This was defined by Gergen (1978) as “the capacity to challenge the guiding assumptions of the culture, to raise fundamental questions regarding contemporary social life, to foster reconsideration of that which is taken for granted and thereby furnish new alternatives for social actions.” The aim with the early image of Appreciative Inquiry was that it could do that by making its impact from the creations of new ideas, perceptions, metaphors, images, and theories that can lead to better alternatives for organizational actions (Cooperrider and Srivastva, 1987). During the development and penetration of Appreciative Inquiry the main focus has been on its positive approach but without also focusing on its generativity, the impact is not very powerful. Bushe (2010) describes generativity applied to organizational development practices as something that occurs when a group of people discover and create new ideas that are compelling to themselves and others and provoke new actions. A generative idea causes people who hear it to change how they think about things and opens up for new possibilities. A generative intervention is similarly one that creates new ideas that compel people to act in new ways that are beneficial to them and others. This means that Appreciative Inquiry should create this to be generative. It can do so in different ways as it is a quest for new ideas, images, theories, and models that liberate the collective aspirations, alter the social construction of reality, and in this process it makes decisions and actions available which was not available or occurred before. When it is successful Appreciative Inquiry generates spontaneous, unsupervised, individual, group, and organizational action toward a better future. When it is transformational it has the qualities of leading people to new ideas and it leads people to take new actions (Bushe, 2010).

The positive approach is very useful in creating the generative capacity necessary to create a transformational impact (Avital and Teeni, 2009). Some examples that create generativity enabled by positivity are positive stories, ideal images, hope, positive emotions, positive talk, the power of a positive attitude, and the power of focusing on what you want more of (Bushe, 2010). Each of these can contribute to the transformational potential but simply focusing on the positive without the generative will probably never be very effective. Initially many people get blinded by the positive approach that Appreciative Inquiry offers and forget the importance of the generativity. This can lead to cases where change agents dismiss concern about certain problems with an argument of focusing on the positive instead. This can lead

to repressing valuable views and it is not to appreciate and acknowledge the people as a valuable contributors. This is where the generative perspective is important as it can turn a concern into a valuable resource of information. This will be elaborated on later in this section.

Bushe (2010) studied eight schools' interventions by Appreciative Inquiry with respect to their positivity and their degree of change. After the interventions participants were surveyed about how positive they felt after the process. All of the schools had positive results but the study showed no connection between the score in positivity and the degree of change. The transformational degree could instead be found where generativity occurred strongly. Generative stories that lead to transformational change were either generated during the discovery phase or during the design phase, while it was found that the non-transformational schools lacked provocative and generative ideas during the design phase. Another finding was that some of the schools with the greatest transformational change were places that had widely acknowledged problems or concerns which Appreciative Inquiry helped them to address. This shows that the misunderstanding about Appreciative Inquiry ignoring problems is wrong. Management and change sponsors are going to be concerned with problems since they put the effort in doing an intervention in the first place Cooperrider et al. (2008e). What Appreciative Inquiry is offering is not to ignore problems but to approach them in another way. Appreciative Inquiry is as concerned with eliminating problems as other processes, but it does so through generativity rather than problem solving. It is concerned with changing the deficit discourse into an affirmative discourse but this does not imply to ignore problems, only to deal with them differently (Bushe, 2010).

A useful distinction when planning an Appreciative Inquiry intervention is between pre-identity groups and post-identity groups (Bushe, 2001b). He suggests that pre-identity groups or organizations with members, who do not feel a strong sense of belonging or concern for the group, can benefit from a transformational Appreciative Inquiry intervention that creates a stronger sense of identity and membership with the group. In those groups the core questions of telling about the peak performances and experiences in the group or organization are very useful during the discovery phase. This can lead to the creation of a vision of a team worth belonging to. In post-identity groups however, these inquiries are not very productive. Since people are already committed to the group their interest lies in increasing the group's effectiveness and meeting the group's needs. The inquiry needs to focus not only on who the group is but also on what the group does. Especially when Appreciative Inquiry should be used for a specific purpose such as product development, it is necessary to distinguish between pre-identity and post-identity groups in order to design an inquiry which will be generative and thereby create useful new ideas and provoke new actions.

In the following some ways of improving the generativity of Appreciative Inquiry will be described through three perspectives; generative questions, generative conversations, and

generative action.

Generative Questions. The questions asked create the arena for the answers given. The question techniques are important factors for creating generativity. As described earlier it is very useful to recollect the most positive memories and stories of personal peak performance. But in order to create generativity this is not enough. Bushe (2010) suggests that generative questions usually have five qualities: They are surprising and open up for thoughts that people has not thought about before, and cause reflection and thinking. They touch people's spirit and hearts and take them back to meaningful experiences leading to discoveries which impact meaning making and just as important, it opens up for the energy which is required for generative action. They build up relationships by talking about and listening to a focus on the positive and generative. This allows them to be vulnerable, open minded, and willing to publicly dream. Finally, questions force people to look at reality a little differently either by listening to someone or to be asked a good question that reframes reality in a way that is very different to the previous assumptions. Another important thing to note is the importance of the frame around the interviews. If many people are involved in interviewing it increases generativity compared to only letting few people interview. Also, the importance of getting the stories from marginalized members of the system can be very generative. Often, it is during the discovery phase of collecting and discussing stories that new ideas and images enter the organizations narrative and this is a place where the transformational potential is great. Bushe (2010) reminds that the group's identity should be assessed before constructing generative questions. Figure 2.5 shows the four qualities of generative questions.

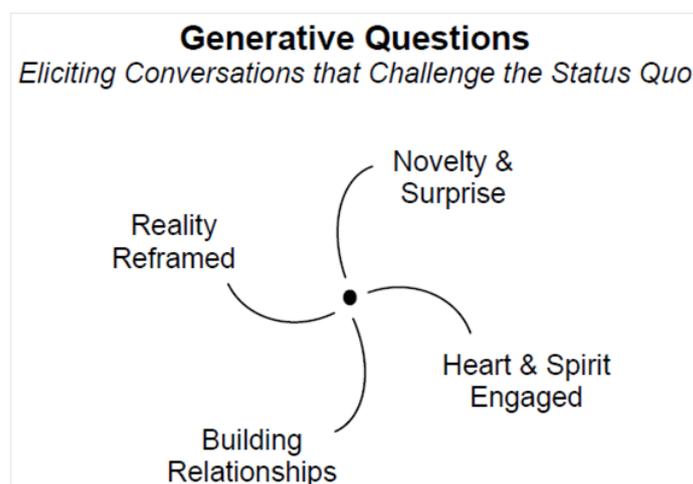


Figure 2.5: Four qualities of generative questions (Bushe, 2007).

Generative Conversations. Generative conversations should happen during all of the phases of Appreciative Inquiry. It does not require a firm focus on only the positive. A good example of this is when someone wants to talk about what they don't like. If they are told they cannot talk about it since it is an appreciative inquiry, it is likely to repress and turn

that person off. A traditional inquiry would ask the person to elaborate on what they do not like and explore what and why it is not likable. This could be considered a value free inquiry but it would not be very generative. Information will be discovered about the person but nothing about generating a better future. Instead, the inquiry could focus on what is missing, what they want more of, and what an ideal image of the organization ought to be. This kind of inquiry creates a gap between what is seen and what they want to see, and this is where generativity grows from. Bushe (2010) means that it is unwise to ban discussion about what people do not like during Appreciative Inquiry, and especially when they have a lot of emotional charge around it. Instead, it would be more useful to make space for inquiries into negative feelings in ways that contribute to the group's ability to understand and bring its collective aspirations into being. A productive space for negative feelings might eliminate them showing up in unhelpful ways.

Zandee (2008) states that appreciative storytelling rather than the exchange of opinion is a very important part of any Appreciative Inquiry initiative. She states that it is commonly believed that the sharing of heartfelt stories not only expands action but also strengthen the relations that makes positive change possible.

To increase generative conversations it is necessary to think about a design of the interview process which considers what happens with the stories and how a collective inquiry into affirmative topics can take place with enhanced generativity. Methods to enhance the generative narratives includes Synergenesis developed by Bushe (2007). Not only does this method help to generate ideas but it can generate a shift in the organizational narrative as people leave the session being influenced by the stories and conversations involved. The transformational ability of generative Appreciative Inquiry comes when the ongoing narrative is altered by new ideas and images as well as when new valuable relationships are built among participants.

Generative conversations are necessary in the dream phase to power and create highly generative design statements. The purpose of a generative dream phase is to let people uncover values and aspirations they might not have been aware of. The purpose of the design phase is to generate a new social architecture which will actualize these values and aspirations. The output of the design phase is often design statements or provocative propositions. In other words, this means that the statements are generative since provocative by definition means something that generates thinking and action. A successful design phase generates a blueprint that is so beautiful and functional that people will be exited to build it.

The next question is how to ensure buy in and discussion to design statements without long meetings that drain the energy and intensity out of the ideas. This is done by avoiding the paralysis of a consensus seeking approach while creating a high level of agreement and alignment with the ultimate design (Bushe, 2010).

Generative Action. Among a large number of Appreciative Inquiry cases that Bushe and Coetzer (2005) investigated, the successfully transformational ones did not use action teams or top-down management of implementation. Instead, an improvisational approach to the action phase was adopted. The details varied from case to case but in all of them the ideas that had emerged were widely accepted and authorities confirmed that people were free to do whatever seemed meaningful to them in order to move the organization toward its dreams. The role of the leaders also changed into looking for innovative people and exploring how they could help. Bushe (2010) suggests that if the first three phases are generative the destiny phase is likely to be carried out by people willing to step forward to champion parts of the design. Another generative effect of an Appreciative Inquiry intervention is to empower now informal leadership throughout the system that encourages young and inexperienced people to use their full potential even though they have not built up an informal leadership.

The destiny phase can be made more generative by the following suggestions by Bushe (2010): Have as many people as possible involved in the process to widespread understanding and ownership during the Dream and Design phases. Ensure that everybody believe they are authorized to take the organization in the direction of the design, and that they do not need permission to act. Clarify the boundaries of what can be influenced and then allow changes to happen. Get commitment from everybody to take initial action such as by a ritualized event after the design statements have been finalized. Leadership is more generative when it looks for actions that move the organization in the desired direction and finds ways to support and amplify the efforts rather than trying to plan and control. This can be done by tracking and fanning (Bushe, 2001a).

Generativity of the action phase in Destiny can also be enhanced by using Appreciative Inquiry, iteratively making the outcome of one intervention the input to the next. This could lead to an ongoing stream of new ideas, new conversations, and new possibilities. The iterative process is particularly useful for post-identity groups (Bushe, 2010). Figure 2.6 shows four conditions for generative action.

As final comments Bushe (2007) notes that Appreciative Inquiry is still affected by traditional change variables. This means that good facilitation skills are still necessary to carry out large group sessions, and good leadership with passion, competence, and legitimacy can make the difference. Appreciative Inquiry can lead to transformational change and its positive approach will lead to generativity. Appreciative Inquiry is not different because it focuses on the positive, it is different because it focuses on generativity instead of problem-solving. Appreciative Inquiry does aim to change issues and problems, but instead of trying to solve problems it generates a collective agreement about what people want more of and want to do together as well as enough structure and energy to create action to reach the agreements. In the meanwhile the problems get solved.

To conclude, appreciation means not only to value but also to know, to be conscious of,

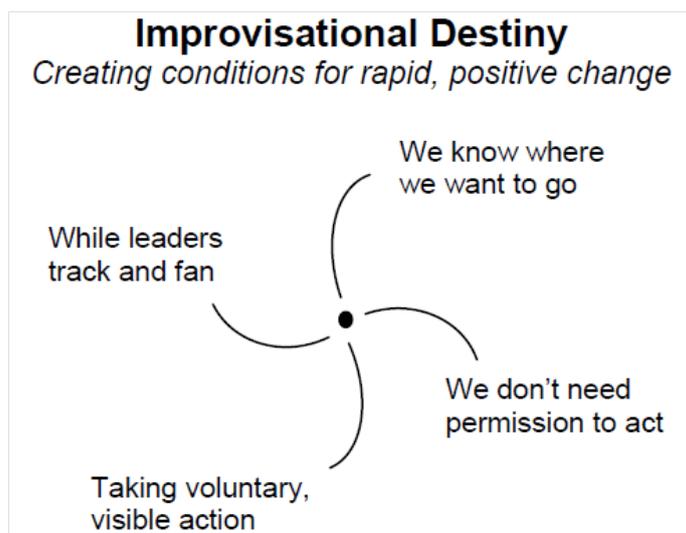


Figure 2.6: Four conditions for generative questions (Bushe, 2007).

and to take full or sufficient account for. In this way the term is clarified and elaborated on in a way that creates room for appreciating the conflicts and hidden resources that lie in contradictory opinions. By appreciating the energy that can be created in this tension field and by focusing on how the energy can be used constructively, Appreciative Inquiry can be used even more effectively.

2.4 How can the Approaches be used in Chemical Engineering?

In this chapter a lot of theory has been presented which has all shaped the positive revolution in the social sciences. Based on Social Constructionism the fields of Positive Psychology, Positive Organizational Scholarship, and Appreciative Inquiry have been presented along with specifics about their applications in leadership, organizational development, and development processes. In this section a short extract of the theories will be taken to illustrate the potential of using Appreciative Inquiry in chemical engineering.

2.4.1 Team Work with an Appreciative Approach

There is no doubt that the positive and appreciative approaches have a large potential for enhancing the team work in many organizations. In general, any organization can benefit from this approach as an alternative to the problem-solving approach to social systems. This does not mean that problem solving should be abandoned, but instead that it too often is used automatically where an appreciative and inquiring approach would be more beneficial. In particular, many engineering organizations are using problem solving too much, which is

no surprise as they have success with the approach for solving technical issues. What can be won by introducing positive and appreciative approaches in engineering organizations?

Appreciating Others. The basic assumption from appreciative leadership about recognizing others for their engagement, competence, and ideas, as well as recognizing their views through the lens of autopoiesis, might seem simple but the potential is huge. Much miscommunication, conflict, and disagreement comes from the assumption that the other person is wrong or has a weird attitude towards an issue. If the automatic answer to a situation like this is to ask questions to understand the other person because of curiosity about their point of view, I believe that much confusion could be avoided, and more important I believe that generativity would increase due to the presence of more generative conversations (cf. section 2.3.2). This also applies to the situations where someone tells about an idea that seems strange or “wrong”. Instead of using the critical mind, the idea could be collaborated on and improved until it is ready to test critically.

Selective Inquiring. The theory of Appreciative Inquiry states that the focus of an inquiry is likely to create more of the thing in focus. This means that a selective choice of inquiry can improve many issues. By inquiring about the things that are desirable they move into focus and become the issue of conversations, exploration, and probably creation. In general this has been tested in cases of social systems, but technical systems can benefit from this approach as well.

Positive environments. The creation of positive environments which is a desired outcome of most Appreciative Inquiry interventions can bring several desired results. Creativity among people is likely to be improved (cf. section 2.1.1), the relations are likely to be improved which improves learning and decision making (cf. section 2.1.3), and it can lead to positive deviance and excellence. The approaches focus on how people can get positively catalyzed by each other to accomplish great things together.

Positive and Appreciative leadership. The potential of using positive and appreciative leadership is huge for knowledge dense organizations. They often depend on their employees to create positive deviance for them to succeed. This means that the development, team work, and work environment of the employees are of key importance. Both leadership approaches are handling these issues well.

Valuing Diversity. The built-in assumption in Appreciative Inquiry about valuing diversity and different points of view is of increasing importance in organizations in the globalizing world. The appreciative approach is valuable when dealing with different cultures, as it seeks to bring forth the best from diversity and different points of view. This both applies to different nationalities, social levels, but more importantly it can also be applied to what I believe will be an interesting field of tension in the future when the generations Y and Z, described as the MeWe-generation (Lindgren et al., 2005), are ready for entering the job

marked.

2.4.2 The Process of Technical Inquiry through Appreciative Inquiry

Appreciative Inquiry might have a large potential as a method for solving technical problems and innovating new technology. It is in its early stages of development, and problem solving has been successful for centuries. In fields with a need for much integration of different skills and knowledge and costumer involvement, Appreciative Inquiry could have a large potential as the inquiring process, i.e. software development (Avital et al., 2006). In other fields such as chemical process engineering where innovation typically has been carried out by long-time experts with large amounts of mathematical modeling it is less straight forward. How can a development method based on Appreciative Inquiry yield positive results compared to problem solving?

Prospective Solution Orientation. Appreciative Inquiry is prospective by nature as it seeks to develop dreams for the future and use their guidance. Appreciative Inquiry is solution oriented as they do not focus on the problems but on the positive aspirations for the future. In science and technology the usual approach is to identify a problem then analyze the situation and finally work out a solution. In Appreciative Inquiry the approach of the problem is turned around by first identifying core competencies, then dream, and finally design how to obtain it. This might lead to better solutions to problems since they are approached quite differently.

Increased Generativity. A successful Appreciative Inquiry intervention is generative. This means that it generates action that leads to change. By using an approach that has a focus on generativity it is likely to be more innovative, creative, and more disruptive. This goes both for the development of the involved people as well as the results of the technical development process.

The way Appreciative Inquiry can be used in technical development processes will be a key topic later in this report.

2.4.3 AI in Management and Organizational Structure

The new thoughts that have been presented in this chapter are also affecting ideas in management and organizational structure. By appreciating other people and recognizing their thoughts as just as valuable as our own, the idea of the role of management shifts in a direction of less control. This means that decision power is moved away from management and toward every individual. By doing this, new organizational structures can emerge which are more effective in supporting the organization with its new demands. When decision power

is moved away from management and focus is on creating processes capable of supporting decisions from everywhere in the organization the flexibility of the organization increases. This is highly desirable for innovation organizations such as in the chemical industry.

2.5 Summary

The Positive Revolution is a shift in thinking that focuses on elevating strengths and potentials instead of solving problems. The theoretical basis is Social Constructionism which implies meaning to be created by the language that is used in our relations. Three approaches illustrate practical implications of Social Constructionism: The systemic approach views organizations as coherent and changing systems and not just a gathering of individuals. The context and their relations are important for meaningfulness. The appreciative approach stress that we create more of the things we focus on, and that appreciation is a prerequisite for learning and development. Inquiry is a creation process that influences the system. The narrative approach stated that we organize events and experiences based on coherent narratives. No action has meaning in itself, but instead it gets meaning from the narrative it is a part of. We form and re-form our understandings of ourselves and others through the stories we tell others. We position ourselves and others through narratives. The narratives can be changed and retold to change the meaning of actions (Haslebo and Lyndgaard, 2008b).

Appreciative Inquiry is a methodology for positive change which takes its starting point in the positive core and expands it to create the desired future. Like most interventions it can be used to solve problems in organizations but the approach is quite different than traditional problem-solving. Appreciative Inquiry aims at circumventing the problem by focusing on the desired solution instead. This is done by discovering the positive core of the organization which might be used as a starting point for moving the organization past the problem. This creates positive expectations about the future that people long for, and these pictures lead to the desired action.

Appreciative Inquiry has the advantage over problem-solving that it focuses on reaching the desired state while maintaining strengths and it is open to alternative solutions. The problem-solving approach is typically limited to solving the immediate problem rather than searching for the best alternative. A simple story about a bucket with clean water illustrates the differences in thinking:

The bucket of clean water unfortunately had gotten a clod of mud into it, and the clean water had to be used. The young problem-solving boy quickly identified the mud as the problem and grabbed around it with his hands to remove it. But just as he did, the mud got dispersed and spread to fill the entire bucket. The young appreciatively inquiring

girl would have used another approach. Instead of focusing on the mud she focused on the water. She realized that the clean water was still accessible and by draining out the water into another bucket she addressed the problem without focusing on it.

This illustrates that different ways of thinking can yield different outcomes. The appreciative approach is concerned with the process of analyzing as well as solving the problem.

The appreciative way of thinking also has advantages for motivating people by positive meaning, for enabling knowledge sharing, for creating useful and forward directed evaluations, and creating energy to act out generative change. It also has an interesting potential for the use in technology where its use as an alternative to problem-solving might lead to successful outcomes.

In the following chapter the organizational subsystem of structure will be explored in relation to how Appreciative Inquiry can be used in organizational design and processes.

3

Structure: Design of Appreciative Organizations

“If you want to build a ship, don’t drum up the men to gather wood, divide the work and give orders. Instead, teach them to yearn for the vast and endless sea.” - Antoine de Saint Exupéry

Appreciative Inquiry has inspired to the creation of new organizational structures, processes, and management methods. The aim of this chapter is to investigate these focusing on their potential use in chemical engineering.

In chemical product development there is a need for integration mechanisms between the different departments and people who are involved in the development. During the past decades this has led to the development of new organizational structures in product engineering companies. The desired structures are characterized by an organization based on workflow and a minimum of layers rather than the hierarchy of compartmentalized functions that were favored in the past. Also, the information channels are built into the system, and the focus on customers and markets is integrated into the development process instead of being a separate function. Finally, the interfaces between functions are less defined and there is more operating autonomy than in earlier structures, leading to more flexible and agile organizations (Paashius, 1998). Development is already happening in the chemical industry, but Appreciative Inquiry might be used to fulfill these needs even further. As the quota-

tion by Saint Exupéry illustrates there are different approaches to organization and creating structures that allow people to accomplish great things. Appreciative Inquiry approaches these issues with assumptions that are fundamentally different than most traditional ways, and this might lead to great outcomes if utilized effectively.

This chapter will explore how we can design appreciative organizations by looking into management principles, structures, and processes inspired by Appreciative Inquiry. The goal is to find out how they can make integration better and allow people to flourish and better use their knowledge and strengths. The first part of the chapter introduces the concepts Managing as Designing and Design with a Positive Lens that build on Appreciative Inquiry. The concepts yield inspiration to the second part of the chapter on how to build appreciative organizational structures and the third part on how to create generative processes.

3.1 Appreciative Design

A new approach to management has been introduced by Boland and Collopy (2004). They propose that managers should adopt a design attitude rather than a decision attitude to a larger degree than they do. This has inspired managers to investigate how focusing on design can have great potential for management and organization. Design with a Positive Lens is an approach to design that has adopted Appreciative Inquiry as method instead of problem-solving. This section will introduce Managing as Designing as well as Design with a Positive Lens as inspiration to the following sections.

3.1.1 Managing as Designing

During the past 50 years management practice has been developed extensively and its tools for problem solving have continuously been improved. In this decision attitude, problems are solved by rational choices between alternatives with the use of tools such as economical analysis, risk assessment, simulation, and time value for money. The decision attitude is concerned with methods, algorithms, heuristics, etc. that can be used to make decisions. Although these analytical approaches are very strong and well developed, they share a central weakness as they take for given the alternative course of action that managers can use in making choices. They start with the assumption that alternatives are readily at hand or are easily obtainable (Boland and Collopy, 2004).

In contrast to this, the design attitude is a new way of analyzing and making decisions. The design attitude is concerned with finding the best possible answer given the skills, time, and resources of the team, and it takes for granted that it will require the invention of new alternatives. It is the continuous search for how to open up for future possibilities rather than

choosing among existing ones. It is an approach that allows for stepping back from decision making and asking what we are really trying to accomplish. In a changing world of today there is an increasing need for design thinking (Boland and Collopy, 2004). In the design attitude, the responsibility of managers is not to choose the best alternative of the ones that are being presented but to transform the situation into something better. Whenever a new idea comes up, instead of deciding whether to choose it, designers ask why. Ideas in designing are not something that has to be taken a decision about, but something that can be played with. It is also important not to fall in love with the first good idea. There are better ideas that just have not come up yet (Boland, 2009).

The decision attitude is too biased towards an early closure of the problem solving space, and the design attitude is too biased toward keeping the search going long after it is beneficial. As Boland and Collopy (2004) puts it, there is a time for openness and a time for closure in project based problem solving, and managers need to develop strength in obtaining both the decision and the design attitudes.

Simon (1996) also calls for a new curriculum for management education based on design. Traditionally the task of natural science has been to teach about the natural world and the task of professional fields such as engineering and business to teach about artificial things: How to make artifacts which have desired properties and how to design. In this century he argues, it is ironic that the natural sciences have almost driven the artificial sciences away from the professional school curriculum: Transferring engineering schools into schools of physics and mathematics, and business schools into schools of economics and analysis. This means that the emphasis on design has been gradually missing. He argues that the responsibility of the manager is not to discover the laws of the universe but to act in the world to transform existing situations into more preferred ones. Managers are like architects and engineers form-givers who shape organizations and economical processes. That is, these fields are concerned with the contingent; not how things are but how they might be, i.e. design.

Simon (1996) argues that the first step on any problem solving project is to represent the problem, and to a large extent that representation has a hidden solution within it. A decision attitude carries with it a default representation of the faced problem, while the design attitude questions the way the problem is being represented. He invites into a design with no final goals rather than leaving more possibilities open for future generations that our generation inherited. Also, he invites into creating the largest number of diverse experiences as possible to be able to draw from an ever wider variety of idea sources, to make designs humanly satisfying as well as economically viable.

Avital and Boland (2008) argues that in modern organizational life, management connotes decision making and production connotes design and implementation. This great divide between boardrooms and manufacturing floors is reinforced by two mutually exclusive vocabu-

laries. One about optimizing constraints, hedging risks, and selecting among predetermined alternatives. The other has to do with envisioning new products and revolutionizing work processes.

Although it can be argued that managers and engineers should adopt a design attitude it is not clear how to do so in practice. This question will be unfolded in the following sections about design with a positive lens and design of appreciative organizations.

3.1.2 Design with a Positive Lens

Whether designing organizational structures or processes, an emerging perspective of applying positive approaches has been developed. Design seen through a positive lens will be described in this section. The positive lens refers to the emerging perspective that emphasizes the capacity to build better organizations and technologies through a discourse that encourages human strengths and participatory action in leading organizational change. The positive lens is reflected in the focus on the potential of designing hopeful and innovative organizations and more humanly centered technology, which are not dominated by the detection of error and control of deviant behavior. This is similar to the shift in positive psychology that turns away from focus on treating dysfunctions and toward encouraging human potential. This allows managers and engineers to find themselves in the midst of an attention shift that emphasizes our capacity to build better organizations and technology by drawing on the best of human capabilities. This shift affects the way managers, policy makers, and engineers frame their discourse as they design and shape their organizations. The positive lens is a way of encouraging and enhancing a design attitude (Avital and Boland, 2008; Avital et al., 2009).

Adopting a positive lens and a design attitude at the crossroads of technology, organizations, and society might open up for new horizons and uncover previously overlooked possibilities for creating organizational and social well-being. The positive lens opens up for broader considerations of social context, uses cross-disciplinary tools, takes a holistic approach, and emphasizes a responsible, ethical attention to human possibilities. A central principle is inclusion of all possible voices in a participative fashion. Whether it is a community-based dialogue or a collaborative participatory design project, their success increasingly depends on their organizer's ability to create a collaborative environment in which actors may celebrate their differences and work with others in building a shared understanding of the systems from which both problems and solutions emerge (Avital and Boland, 2008).

Adopting a positive lens is likely to cultivate engaging practices that are conducive to self-discovery and innovation through the encouragement of improvisation and inquiry into intended and unintended features of a design artifact, which may be objects, systems, methods, processes, or even experiences. This attitude can also be cultivated by encouraging people

Table 3.1: Characteristics of Design with a Positive Lens (Avital and Boland, 2008).

	Design with a Positive Lens is...	Design with a Positive Lens is <u>Not</u>...
• Guiding Questions	Asking what gives life Asking what could/might be Asking what should be	Asking what is Asking what will be Avoiding challenging questions
• Approach	Synthetic Emergent Systemic, inclusive Continuous Appreciative	Analytic Deconstructive, reductionist Isolated, exclusive Ad hoc Judgmental, deficiency-seeking
• Process	Iterative refinements Infinite, open-ended, generative Making decisions Pervasive and core-related	Straight forward linear process Finite, close-ended, conclusion-seeking Analyzing decision making Cosmetic
• Underlying objective	Aiming to promote virtuous cycles Triple bottom line	Aiming to prevent or escape vicious cycles Ignoring bottom lines

in practice networks to share experiences and ideas for improvements, as well as by encouraging grassroots entrepreneurial projects (Avital et al., 2009). These are some examples of the perspectives of Design with a Positive Lens.

The positive lens is less focused on the detection of mistakes and gaining superior control, and more concerned with positive change that involves the encouragement of what is best in humans and emphasize a search for the conditions that increase our capacity to construct more satisfying and morally strong organizations and technologies. The application of a positive lens to design and management is a part of the movement of positive ways of knowing such as Appreciative Inquiry, Positive Psychology, and Positive Organizational Scholarship. This approach is based on the realization that success is not the logical opposite of failure, and that the study of what went wrong may only serve those who want to avoid failure while it is a poor foundation of those who want to do great. Thus, the research with a positive lens explores what leads to exemplary designs rather than prescribing preventive tactics. Table 3.1 adopted from Avital and Boland (2008) elaborates more on how Design with a Positive Lens can be understood.

Design with a Positive Lens implies that the design questions should focus on stimulating the generative core of socio-technical systems by asking what gives life to organizations. Positive design focuses on desirable scenarios and visions for the future by asking what could and might be, opposed to trying to predict the future by asking what will be. The approach thereby makes a conscious choice of allowing answers to be ethical and personal by asking

should be. The approach is synthetic and value-seeking rather than analytical, error-focused, and deficiency-seeking. The processes of Design with a Positive Lens are organic, iterative, and open-ended in contrast to being subsumed by decision trees of design choices with a clear beginning and end. Finally, the objective of positive design is to create and maintain virtuous cycles for the benefit of all stakeholders in contrast to preventing or escaping vicious cycles (Avital and Boland, 2008).

The positive lens inspires to give meaning to Managing as Designing. Developing and managing organizations and systems through a positive lens is likely to result in better tools, better systems, better organizations, and better outcomes. The positive lens allows one to escape the gravity of the deficit rationality and clears the way for the development of a humanistic and relationship-driven design framework, which is based on shared responsibility, blurred boundaries, and collaborative effort.

To adapt and prosper in a time of accelerating complexity, organizations need a new way of driving a dynamic balance between work processes and grass-roots generativity. The positive lens offers this approach.

Five areas of interest for the Design with a Positive Lens are presented on Figure 3.1 (Avital et al., 2006). They are aligned with two continua: The intrinsic-extrinsic orientation classified between internally-oriented and externally-oriented, and the socio-technical orientation classified between the human systems-oriented and the artifact-oriented. These areas show that Design with a Positive Lens has a potential for many of the topics in this report. It can be applied in organizational development, in work processes, for external collaboration, and in design methods.

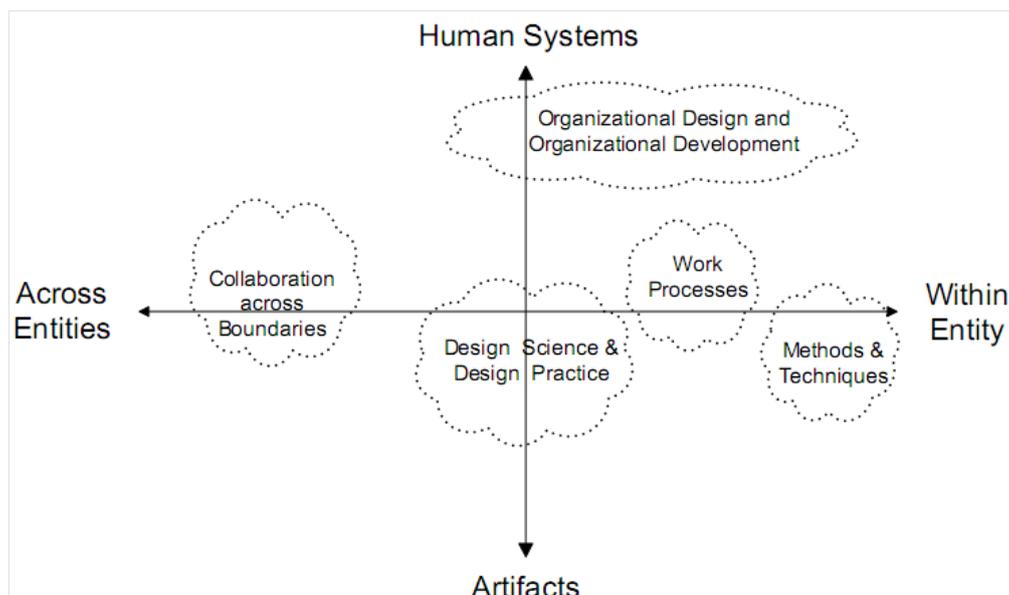


Figure 3.1: Five areas of systems design thinking with a positive lens (Avital et al., 2006).

Positive work processes. This area is concerned with designing creative and high performance work processes as well as on the changes in work processes, routines, and procedures that happens from using the positive lens.

Positive design methods and techniques. Focus of this area is on the effects of adopting positive design methods on the outcomes of systems design, industrial design, and artifacts of design such as products.

Positive collaboration across boundaries. This area focuses on a positive spin on organizational theory and organizational development perspectives which open up for interactions across different disciplines.

Positive design science and design practice. This area is concerned with the possible influences of the positive lens on design as a discipline and on designing as a core activity.

Some key implications of using the Design with a Positive Lens perspective in organizations and design processes are the importance of questions and the language, a good relationship between the positive and the critical attitude, and well designed positive processes.

Building on the fundamentals of Social Constructionism the vocabulary in use is a key determinant of the cognitive ability and consequent action for people. Different vocabularies are likely to build different thinking, insights, and behavior patterns. Vocabularies define action and different vocabularies yield different outcomes. Within the design process it is therefore necessary to use a well-chosen language and in this sense the positive lens can make a difference. For example, is the challenge referred to as a problem or an opportunity, are the approach used for analysis a gap analysis or Appreciative Inquiry, and are terms used for stating the design challenge deficit based or appreciative based? Using a positive language the outcomes are likely to be produced from an opportunity seeking outlook, the best available capabilities, and having a desirable future in mind (Avital et al., 2006).

Positive design does leave room for criticism. Behind all the positive talk and aspiration, there is a need for constructive criticism to move projects forward and to reframe understandings. Too much focus on positive affirmation may inhibit the productive role of criticism (Avital et al., 2006). Appreciative Inquiry offers an alternative to unproductive criticism, i.e. solution based generativity. It is therefore necessary to incorporate a critical view to design processes while still affirming the positive overall approach. This is discussed further later in this chapter.

The term design is often operationalized as an action in a development process and divided from implementation or making. This discourse tends to isolate design and making and the reciprocal relationship between the two is often neglected. The details in the design influence the making, and the making should impact and alter the nature of the design. Design is therefore only complete when it includes considerations of its realization (Avital et al., 2006).

3.2 Designing Appreciative Organizations

Whitney (2008) describes how ideals and images of organization design have changed dramatically during the past decade. Successful organizations have adapted the social innovations such as access to vast amounts of information, communication among members, and diversity. Bureaucracies that operate on the belief that knowledge is power has been surpassed by organizations that are open with shared information networks and chaordic structures (Hock, 1995). Power based chains of command structures has been replaced by team oriented structures where employee engagement is valued. Hierarchies with top-down decision making has shifted into self-organized and horizontal structures. These new forms of organizing are responses to a redirection in purpose and strategy of businesses as well as leadership styles, decision making, employee processes, and organizational structures (Whitney, 2008).

The new successful organizations care much more for their employees, their development, their life, and their success than traditionally. People are given decision power to set their own hours, working relationships, etc., and the companies are providing supplementary courses for personal development, and in the USA they pay for health insurance. The point that Whitney (2008) draws is that many of these successful companies have the fact in common that they are life affirming.

Many creative and innovative organizations are life affirming. They focus on the strengths of their people and their desire to excel. They search for what gives life to people, communities, and the greater good such as the environment. They focus on vitality and health when doing business, and in their products, services and their organizational designs. Whitney (2008) calls them examples of a new genre of organizations. They have found a call to abandon modernist theories, processes and organizational structures based on mechanical, rational, objective assumptions, and instead embrace the vitality of organizations designed to affirm, nurture, and sustain all that is life giving.

In this section principles of appreciative organization will be explored as well as examples of these new organizational structures.

3.2.1 Principles of Appreciative Organizing

What gives life to organizations? Whitney (2008) has identified nine life giving principles of appreciative organizing :

1. Evolutionary Purpose
 2. Harmonious Wholeness
 3. Appreciative Leadership
-

4. Positive Emotional Climate
5. Strong Centers of Meaning
6. Just in Time Structures
7. Liberation Economics
8. Engaged Participation
9. Caring Culture

These principles will be described in the following with focus on how they can be applied to a product engineering organization.

Evolutionary Purpose. The purpose is a central organizing element for an organization that can awaken the heart and mind of people. What is a purpose that gives life to human organizing? Appreciative organizations calls for a purpose that is socially uplifting. An emotionally purpose is inspiring to work for and beneficial to customers, and it gives organizations a strategic sensibility to long term implications of decisions and strategies. An evolutionary purpose shifts focus from short term gain to focus on the ideal future, that ensures life to continue to flourish and thrive into the future. These life affirming organizations take responsibility for sustainability. Appreciative organizations recognizes the power business has in influencing people and their habits. This leads to the question of how businesses can use its significant influence toward sustainability. These life affirming organizations address this questions in their products, services and organizational structures. Whitney (2008) states that the more the purpose of a business is focused on sustainability, the greater its life affirming impact.

The perspectives of this principle for an a product engineering company are many. An evolutionary purpose can elevate the employees, it can build better relations for the stakeholders, it can be an inspiration to innovation and it contributes to building a better world.

Harmonious Wholeness. Appreciative organizing shift away from practices and designs that separate people and break things apart to practices of wholeness (Whitney, 2008). This invites for the use of large group processes such as the Appreciative Inquiry Summit (Ludema et al., 2003) and Open Space (Owen, 2008). Wholeness can bring forth great things when drawing on diverse ideas and aligning strengths to create a harmonious direction forward. Organizing through harmony creates a committed path forward that honors differences.

Logics separate parts to make them manageable whereas wholeness deepens related issues to bring them into harmony. Logics explain the past whereas stories and experiences of the whole give meaning and inspire for new possibilities and actions. Wholeness recognizes the diverse perspectives that exist in any situation. The curiosity about multiple explanations and stories can lead to a larger sense of wholeness and harmony among different people.

Appreciative organizing recognize the value of wholeness and depends on the processes for harmonizing the diverse interests, abilities, and dreams of people. The shift from logics to wholeness as the basis for engagement, decisions, and actions yields a large potential for these organizations.

Product engineering companies can benefit from this principle by organizing in ways that allows for much more diversity in perspectives and ideas. This will bring forth the best in people and create a huge potential for innovation .

Appreciative Leadership. As described in section 2.4 Appreciative Leadership has a great potential for engineering companies. The inclusive approach can both be meaningful to lift the potential of the members of the organization but just as important is shows the potential of partnerships .

Positive Emotional Climate . A positive emotional climate is very valuable as described in section 2.1.3. Goleman (1999) as well as Fredrickson (in Whitney, 2008) have shown a direct correlation between the presence of positive emotions such as joy, optimism, and curiosity and high impact business goals such as innovation, achievement, and cooperation. A positive emotional climate can also create the shift from criticism to appreciation. This is likely to lead to upward spirals of achievement for the people as well as organizational results. One of the conditions that can create these positives is a shift from a climate of fear to a climate of safety where people safely can speak up about new ideas and thoughts.

This is of great importance when designing appreciating organizations. Generally people in engineering companies are well educated in problem solving towards technical systems due to the educational background. This often means they will use the same approach with social systems, and that is likely to create undesirable effects. The focus on positive emotional climate when designing the organizational structure is likely to improve the positive effects that this can create.

Strong Centers of Meaning. Vitality in organizations increase with meaningfulness, but the meaning varies among social groups within the organization. This means that an important organizational design question is how to design organizations that allows for differing groups of people to experience meaning harmoniously in relation to one another. One answer is to move from control to choice, meaning than organizational structure should support the freedom of choice to a large degree. Most people are better suited for designing their own tasks and ways to contribute to the success of the organization than a generic plan can do it. The process of doing this should focus on being meaningful.

When identifying the need for collaboration as just mentioned, the meaning of authority dramatically changes. Organizations that are collectively capable becomes moves past organizations that have authority over people and resources. This means that the new organizations are moving from authority to collaborative authoring, and that everything from products,

services, processes, and budgets become horizontally organized and co-authored by people and collaborators that are valued due to their equal contribution to creating greater meaning and reaching results.

The implications of this principle are that meaningfulness should have room to be polyphonic, and that the organizational structure and processes should be meaningful to diversity of people.

Just in Time Structures. Design requirements change over time and situation, but traditional organizations have structures that are built to last by bricks and mortar. New structures have emerged that Whitney (2008) designates 'just in time structures'. Most of these are based on information technology and yield great new possibilities for the design of appreciative organizations. Examples of just in time structures are online virtual rooms that can act as platforms of decision making, information sharing, and dialogue. Distributed structures engage stakeholders in the entire value chain, and this is a way of structuring that enlivens the whole.

Appreciative organizing invites for a shift in thinking about organizational structure. Instead of assignment of roles it invites for an continuous alignment of strengths. This is based on the belief that work is best performed by the people who have the skills and enjoy in doing it. Delegation of tasks to people in roles rather than to people with the interest and capacity does not unleash the potential that exist in designing work for people that use the full range of their unique talents and skills. By utilizing the greatest potential in people it is more likely to create a state of flow (cf. section 2.1.1) with all the benefits this can create. Moving from role based work to strength based work implies a shift in assumptions about people, that turns into believing that each person's talents are enduring and unique, and that the greatest room for growth is in areas of greatest strengths (Buckingham and Clifton in Whitney, 2008). The role of managers turns into being the delegation of work to aligning strengths and ensuring the success of people and teams.

Just in time structures also move from the importance of the clock to importance of the tasks. Such structures find ways to loosen the practices controlled by the clock and turn them into practices that support relational time. This includes job sharing, flexible time, flexible hours, virtual teams, etc. This supports the changing demands of people during different parts of their life and enables a focus on content rather than structure.

For an engineering company the elements of Just in Time structures can be found useful. The use of online platforms for innovation has been used with success by Vestas to engage their global engineers in dialogue across departments in order to create new technology (Presented to me by Rene Balle, director of global research, at a network meeting in November 2009). The distribution of power into the entire value chain is also interesting and the idea similar to the decision power of each individual in Total Quality Management . The strength based

approach rather than the role based approach may yield better results in performance.

Liberation Economics. The design of more appreciative reward systems, currencies, economic policies and practices also has a potential to be improved. Instead of a focus on better motivation of the individual these systems could be focused on enabling opportunities for people and fostering collaboration among people that feel cared for and then confident to contribute to the good of the whole. Whitney (2008) states that it is not only possible but essential to redesign economic systems through a positive life giving lens, be it inside organizations or the entire world economic systems.

Engaged Participation. In life affirming organizations people are engaged in participation and can choose to self organize in order to address relevant issues. People are able to choose to work from their strengths and on what matters to them, and they tend to bring more enthusiasm, commitment, dedication and energy into the work. By moving from span of control into circles of resonance the people get energy and commitment to their results.

When organizations have a certain size they there is a need for connection, link, coordination and integration among the different entities. This creates a need for a central body of people and processes that has a purpose of uniting the differing and unique entities without making them common. Rather than being a top down executive body that initiates strategies, the role of the central body is to support the initiative and work of the different groups. This changes the view from 'few at the top directing the many who do the work' to 'the many doing the work calling for central support'. A strong coherent center supports local centers of resonance in creating their own future while being sensitive, aware, and integrated with the whole. The purpose of the central body is to create harmony among the unique and essential parts of the whole (Whitney, 2008).

These thoughts open up for possibilities for an engineering company to harvest the energy from having self organized networks of practice, etc. It also creates the opportunity of perceiving the central body of the organizations as creators of harmony rather than controllers of authority, which may lead to better leadership in an appreciative organization .

Caring Culture. Life affirming organizations have a deep sense of care that creates safety, builds trust, and contributes to the creation of harmonious work environments. The people who offers care are opening hearts and minds while unleashing energy for cooperation and productivity. Care in this sense refers to care for relationships, commitments, quality of work, results, people, words used, nature, people, and so on. The word care refers to three dimensions: Taking care of, mindfulness, and significance.

In a caring culture the consciousness is different. Work is seen as a practice field for spiritual cultivation, meaning a place for learning, personal development, growing, and fulfilling a meaningful potential. It is the means for enhancing the collective consciousness of society, it is the means of evolution. Caring cultures do not praise action for the sake of action, change

for the sake of change, or faster for the sake of faster. Mindfulness is developed in the way decisions are made and work is done. Mindfulness might lead to slow success but it leads to doing work with deeper and more sincere respect for life and being successful (Whitney, 2008).

Avital et al. (2006) propose that silence and reflection also opens up for the possibilities for improvisation and contribution, and for enabling people to reconnect. In many organizational environments it requires an explicit effort and skill to reflect on a potent situation in progress, to bring all pieces into harmony, and to develop a constructive and forward-looking response to the situation.

Embracing Tensions. Avital et al. (2006) adds to the discussion about principles of positive organizations that they should embrace tensions. They state that tensions and paradox are inherent in organizing and need to be acknowledged and balanced continuously rather than denied. Creative interplay can be life-giving to knowledge based work groups, but how to speak positively in tense dialogues is a thoughtful task. Acknowledging tensions enables people to blow their steam and become emotionally intelligent about their decisions and conduct. Embracing tensions allow people to agree to disagree, and thereafter to work out an acceptable compromise .

Evaluation of Validity. I find these principles inspiring for how to design and build appreciative organizations. If an appreciative approach has been chosen and developed in an organization, these principles will be useful in working out specifics about how to organize. But, this research is in its early stages, and there has not been carried out or documented any validity of these principles. It would be interesting to investigate the principles for their validity in order to refine them and turn them into a theory of appreciative organizing. Nonetheless, the principles have a fine logical coherence with the rest of the approaches in this report and can be used as inspiring guidelines for anyone who wants to design appreciative organizations. And some of the examples point in directions of entities that have been documented valid of improving performance, such as some of the just in time structures.

3.2.2 How to Organize without Coordination

When people get organized the cost of organization might be high. Weick (2004) describes two worries that arise when ideas have to move through too many layers of people. Organizational design scholars worry about uncertainty absorption and loss of details. The architect Frank Gehry is worried about the translation of ideas through the many people involved who frequently drain the strength and power out of an idea.

Weick (2004) draws a distinction between perceptual and conceptual processing. In the mode of direct perception people draw knowledge through active exploration. The cognitive

processing of the perceived is stimulus driven. Continuous use of the perceptual mode make people know more and more about less and less, making it easier to forget the name of the thing seen. In the mode of conceptual processing, knowledge is developed by description rather than acquaintance. Here, the cognitive processing is schematic driven instead of stimulus driven. This leads the knowledge to go beyond the information given and the direct perceptions are elaborated into types, categories, stereotypes, and schemas. Continuous use of the conceptual mode makes people know less and less about more and more.

When people have to coordinate and share their knowledge and cognitive structures, they have to take on a certain form. When social complexity increases this makes people shift from perception based knowledge to categorically based knowledge in the interest of coordination. When demands for coordination increases people begin to perceive each other in terms of roles and stereotypes, and distributed cognition becomes more category based to reduce differences and gain agreement. Concepts become simpler and more general in the interest of shareability. While these changes facilitate coordination they have the potential cost of intellectual and emotional distance from the details picked up by direct perception. This is why ideas can get drained from their strength and intensity when they pass through too many layers of people (Weick, 2004).

Also, people who coordinate tend to remember the name of the thing seen rather than the thing seen and felt. If things happen that go beyond their labels, groups tend to use conceptual shortcuts such as normalization instead of acting on the perceived. Refined organizational design can be dangerous in the sense that it might inhibit labels and categories from being updated and in the end, this can lead to overwhelming trouble that has developed unnoticed. More importantly, it might inhibit the discovery of solutions and opportunities because previous categories have been formed. This is analogous to the implications of systems thinking (cf. section 2.2.1) where systems only accept new information if it is in line with its previous experiences unless the system is disturbed.

Lanzara (1999) describes another way to design systems in action. They should be based on transient structures that produce larger, loosely connected structures. Taken as a whole they should possess a high degree of stability and resilience but should locally always be up for grasp. He states that innovation and change in reality is not as well ordered as organizational scholars describe it. It is untidy, fragmented, with apparent undirected evolution, and thereby exhibits a richer phenomenology than is normally acknowledged. Under these circumstances action must become a form of exploration. People need to design, make experiments, test, make something new, and then evaluate. This is where transient constructs can be useful such as minimal structures, ephemeral organizations (Weick, 1995, pp. 374), fugitive meanings, and disposable symbols. Transient constructs can help to make sense in a world where sense making becomes difficult because the preexisting framework is lost, unusable, or inappropriate to the situation.

Bate et al. (2000) observe that organizational design is a bare bone framework on which a more organic, emergent, social structure develops as people interact. It is a paradox since on one hand design creates nothing. It is just an empty vessel to be filled with people, meanings, and actions. On the other hand it creates everything since the organizational design will have a fundamental impact on people's expectations and perceptions. It sets the context for the social construction of roles and responsibilities through which structure is enacted. Organizational structure describes both the prescribed frameworks and realized configurations of interaction, and the degrees to which they are mutually constituted and constituting. This means that organizational designing should be concerned with more than abstract configurations of roles and responsibilities. It should also pay attention to the underlying, emergent processes that connect and activate structural frameworks and combine traditional organization design with microlevel interventions designed to open up and reconstruct the organization's underlying working structure (Bate et al., 2000).

Weick (2004) describes that successful, life preserving, organizational design has been done by designers who stop just when the "good stuff" of specifying structures, procedures, and practices begins. By under-specifying the structure and allow others to add in density the density can retain its vitality because people in the frontline can customize their procedures and structures to meet the demands they actually face.

Hock (1995) observes that management expertise has become the creation and control of constants, uniformity, and efficiency. The problem is that this version of management is no longer what is needed. The need has become the understanding and coordination of variability, complexity, and effectiveness. Based on this observation Weick (2004) concludes that managers need to create designs that mix together perceptual and conceptual modes of action or to move between them and rely on multiple compounds of abstraction. The solution for recapturing intensity is to moderate the need for coordination.

In the following section one approach to organizational design that is focused on minimizing the need for coordination is described.

3.2.3 Chaordic Organizations

Dee Hock founded VISA with a very different approach to organizations than was seen before in the banking industry. Instead of doing something familiar he made the ownership of VISA like an inside-out holding company in that sense that it is held by its functioning parts. It is what Hock (1995) calls a chaord: "*By Chaord, I mean any self-organizing, adaptive, non-linear, complex system, whether physical, biological, or social, the behavior of which exhibits characteristics of both order and chaos or, loosely translated to business terminology, cooperation and competition.*"

Table 3.2: A new class of organizations (The Chaordic Commons, 2005).

Conventional Systems	Emerging Systems
Closed	Open
Top-down and centrally oriented	Multi-centric and self-organized
Corporate	Constitutional
Hierarchical	Distributive
Departmentalized	Fractal
Controlling	Enabling

The idea that living systems thrive in a narrow band between chaos and order has led to the development of chaordic organization practices. Defined briefer, a chaord is any organism, organization, or system that is self-organizing, self-governing, adaptive, non-linear, and complex. Chaordic means characterized by the fundamental organizing principles of nature and evolution. Practitioners have had a desire to create organizations which are self-organizing and self-governing, designed to foster maximum autonomy while enabling coordination and coherence at every scale, able to thrive amid diversity, complexity and change, and compatible with the human spirit and biosphere (The Chaordic Commons, 2005; Hock, 2005).

The emerging system that chaordic organizations is part of is characterized as shown in Table 3.2

Chaordic organizing builds on the insights that nature and evolution are better models for the dynamic and unpredictable world than the efficient but inflexible machines that shaped institutions throughout the Industrial Age. Diversity and innovation thrive where power and information are highly distributed. Competition and collaboration, freedom and governance, individuality and community are not irreconcilable opposites as we often imagine, and the greatest benefit comes when they are harmoniously blended without losing the distinctive strength of each. Communities are held together by ethics, not force, and by the power of their shared beliefs, purposes and identity(The Chaordic Commons, 2005). Chaordic organizations are enduring in purpose and principle. The members' capacity to experience the commitment and purpose in one another is critical to the success of the organization. If the purpose is authentic, it is never exhausted even as participants' understandings evolve. A good example of an early chaordic organization with an authentic purpose can be found in the scout movement. The founder Robert Baden-Powell wanted the movement to evolve through learning-by-doing in a continuous effort to develop and build character in young boys. He is quoted to have said "*if we are not careful, our movement will turn into just an organization.*". This shows how he emphasized the value of having a living movement rather than a controlled organization. The scout idea is more than 100 years old and yet the

purpose is still being lived out by 38 million scouts throughout the world.

Chaordic organization concepts include the upside-down umbrella organization as shown in Figure 3.2. A traditional umbrella organization makes all its members give up autonomy to get a common voice, while the upside down umbrella organization creates a shared ground to build on.

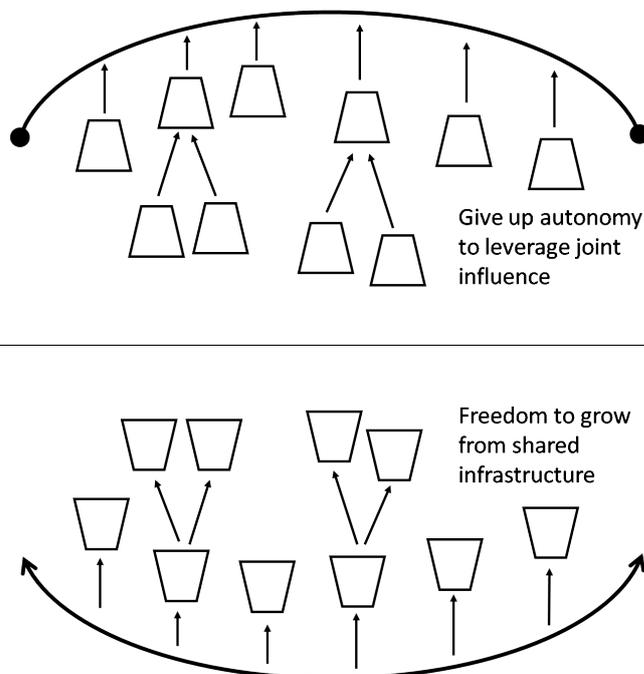


Figure 3.2: A traditional umbrella organization on top and an upside down umbrella organization in the bottom (The Chaordic Commons, 2005).

The Chaordic Commons (2005) uses fractals to illustrate how organizing can be inspired by nature. A fractal is simultaneously a component part belonging to a larger system and an autonomous whole, fully empowered and capable of self-organization and growth. Chaordic organizations can consist of different fractals-like organizational components. They would be embedded within, or connected to, another part of the system. They share the same fundamental rights and obligations as the entities to which it connects. They have the authority of the whole to undertake its scope of operation. This means that they have right to participate, access to common properties, right to create new products and services, and right to create new entities embedded within, or connected to, the initial entity i.e. new fractals-like components.

One of the most inspiring features in the chaordic approach is that it encourages evolution. Evolution cannot be controlled but only influenced. To allow successful evolution, all remaining constraints to growth, self-organization and the vitality of the whole have to be removed.

The perspective in chaordic organization gives inspiration to how engineering companies might organize differently. Most companies are designed according to century old management theories and they are expected to produce innovative solutions for tomorrow. By embracing the principles of chaordic organizing and seeking the tension between chaos and order engineering companies might be able to use new ways of organizing in order to better support their core tasks.

3.2.4 Inspiration from the Arts

Adler (2006) states that dramatic changes are taking place in society, the economy, and technology that are creating a need for 21st century organizations to engage in new, more spontaneous, and more innovative ways of managing. This has led to an increased use of artists and artistic processes in strategy, management, and leadership. 21st century society longs for leadership of possibility, hope, aspiration, and innovation rather than replication of historic patterns of constrained pragmatism (Adler, 2006).

According to Hamel (2007) there has never been a smaller gap between what can be imagined and what can be accomplished. At the same time he addresses the need for new innovative ways of management to substitute the modernistic principles from the 20th century. The new ways form electrical currents of innovation pulses through every activity of the company, where the company actually deserves the passion and creativity of the people who work there who naturally elicit the very best they have to give. He states that this does not exist in any MBA program and that radical new alternatives should be invented.

Adler (2006) answers this call by describing the global trends that influence organizations in the 21st century, and by discussing how the arts can inspire to create the innovative new ways that Hamel seeks.

- **Rapidly Increasing Global Interconnectedness.**
 - **Increasing Domination of Market Forces.** 49 of the 100 largest economies of the world are multinational companies, not countries. This leads to an increasingly important role of private partnerships and alliances.
 - **Increasingly Turbulent, Complex, and Chaotic Environment.** Continuous changes are no longer good enough; by the time an organization has wrung out the last 5 percent of efficiency, someone else has invented the next great thing. From hierarchies to networks and individuals to teams; there is a need for new structures. Planning and time has collapsed and there is a need for simultaneity instead.
 - **As Advances in Technology Decrease the Cost of Experimentation, Organizations' Scarcest Resource Becomes Their Dreamers, Not Their Testers.**
-

- **Yearning for Significance - Success Is No Longer Enough.** Leadership moves from prediction to aspiration. The challenge is to have courage to see reality, and the courage to envision possibility and bring reality to possibility.

This states that the old approaches no longer work anymore, and that the most important resource now is innovative designers not financial analysts. More and more companies have realized that the arts have new perspectives to offer. Managers do not know how to create on cue and innovate reliably on a deadline, but this is something theater companies do all the time. There is a need for the skills for improvisation, and the skills that make orchestras play together. Experimentation beats planning in the new world order, and there is a need for a broader variation and gene pool to allow evolution to carry to organization forward. The conclusion is that arts can and should be used for inspiration when designing organizations and processes with a positive lens.

How the arts specifically can inspire in an engineering context will be described later in this chapter.

3.2.5 What should be Designed in Organizations?

In this section many useful principles and approaches have been presented about how to design appreciative organizations. A framework for understanding the facets of appreciative organization is presented in the following.

When asked about their organizational design, most managers will draw an organizational chart. They equate organizational design with organizational structure, meaning the levels of responsibility, divisions, and reporting relationships. The organizational charts attempt to illustrate and communicate the ordering of relationships and rule governed power structures within the organization, i.e. the formal structure. But this approach to design and describe organizations is limited as it does not take into account the ongoing cycles of behavior which define the patterns of the organization (Katz and Kahn, 1966, in Whitney, 2008). Instead, organizational design of appreciative organizations is a reconsideration of everything that the organization consists of. Whitney (2008) proposes a framework of six interrelated facets that should be taken into account when designing and understanding organizations, as shown on Figure 3.3.

The framework gives an approach to the facets that should be taken into account when designing appreciative organizations, and also when designing appreciative processes. A few comments will be given to each of them.

Artifacts and Technology influence the nature of interactions by design. They create both limitations and possibilities to human interaction. When talking about organizational design

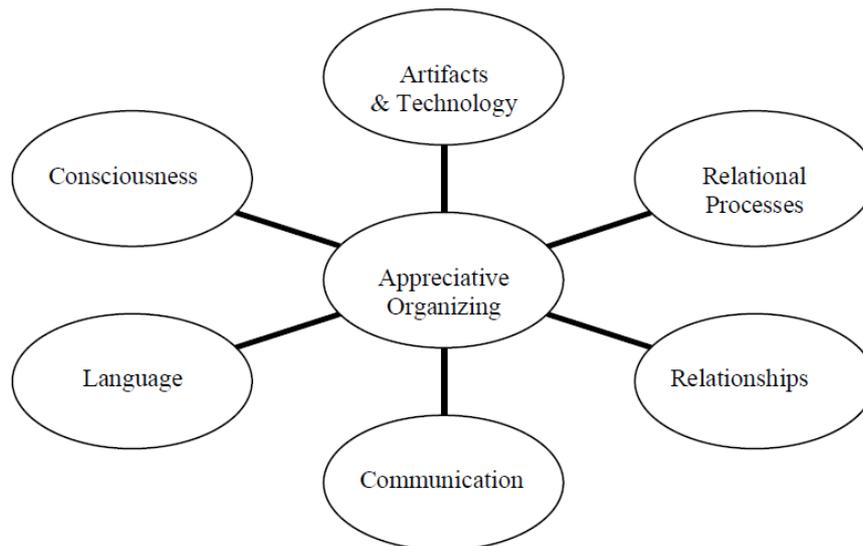


Figure 3.3: Six facets of appreciative organizing (Whitney, 2008).

the implications of technology and artifacts should be considered. Also, because the impact that technology and artifacts can create is huge, e.g. the introduction of the cell phone and the Internet has led to large changes in society. The use of artifacts and technology that supports appreciative organization is necessary.

Relational processes are ways people engage with each other for activities such as information sharing, decision making, achieving results, bringing in new members, developing, etc. Good design of relational processes may enliven people and foster cooperation and innovation. The design of relational processes calls for choices to be made about the ways people are able to participate, contribute ideas, and influence decision making. Inclusive inquiry and dialogue processes can enhance this. This is also supported by large group processes.

Relationships. Organizations are basically sets of relationships that are institutionalized through repetition. Activities together affirm these relationships. Analogous to jazz improvisation where a few people start to play and others join in to take the performance in an unexpected direction, relationships can move the organization in new directions. The nurturing of relationships is important in any organization as they are the actual organization.

Communication. Appreciative organizations call for inclusive and open communication where people participate based on their strengths, interests, and opportunities for learning. The communication patterns within organizations prescribe certain forms of expression. Appreciative organizing invites for an expanded palette of communication that fits the needs of diverse and innovative organizations. Room for polyphonic expressions can enhance this.

Language. The designs of vocabularies, logics, metaphors, and languages render new ways of understanding possible. Some words and logics are more life affirming than others and

foster sharing of experiences, ideas, and information. To design appreciative organizations is strategically to articulate what gives life to people, and to speak values into being by using words, logics, and metaphors that create positive images of great possibilities. This facet can be enhanced by the invention and use of life affirming vocabulary.

Consciousness. Organizations can have different levels of consciousness, and an active focus on building a capacity of consciousness is an important part of designing appreciative organizations. This is important for many of the principles presented in section 3.2.1.

The design of appreciative organizations requires willingness to let go of the designs from the past that no longer serve a purpose, gives life, and limits human potential. The way to do this is to create new generative designs forms of organizing. This requires attention and conscious choice about what to create and its effects. Organizational design is basically about embedding values in processes, conversations, artifacts, and actions that leads to profound attention to relational integrity, social aesthetics, and systemic implications for life.

Organizing has traditionally consisted of four issues: Defining work, arranging work and workers into sensible units, integrating units, and controlling the organization (Meyer et al., 2007). In the design of affirmative organizations these activities should be carried out while having the facets of appreciative organizations in mind. At the same time Avital et al. (2006) propose that four tensions should be encompassed:

Freedom vs. Responsibility. When moving away from detailed job definitions into tasks that build on strengths, the new definitions of jobs should embrace the tension between freedom and responsibility. Work is increasingly getting more complex which leads to a continuous need for re-defining roles, tasks, and working relations.

Old vs. New. Organizations have to deal with the legacy capabilities and resources along with emerging capabilities and resources. Balancing the old and new is essential in everyday work, and needs a differentiation where people can embrace this tension. In product development the impact of legacy and new technology should be connected.

Outside vs. Inside. Organizations must reach beyond their own specialties to get new insights. This means that the integration mechanisms should balance this tension adequately.

Emergence vs. Determination. Organizations have a need for control, and this should embrace the tension between emergence and determination. Since many innovations emerge through sequences that have not been controlled in details, there should be room for this but on the other hand, many processes should be adequately controlled.

3.2.6 Designing Appreciative Engineering Organizations

In the case of designing appreciative chemical engineering organizations there are many inspiring thoughts in the presented. Several of the principles of appreciative organizing can be directly used in engineering companies to introduce the appreciative approach.

The discussion about consequences for coordination is also particularly relevant in engineering companies that often separate tasks to a high degree focusing on the conceptual mode. If they focused more on the potential in the perceptual mode and utilization of integrative and ambiguous organizational design, they might open up for new possibilities.

There is also a potential in embracing the principles of chaordic organizing and inspiration from the arts to create more innovative organizational designs that better support the changing needs of innovative organizations.

The facets of appreciative organizing give a perspective on what to address when designing appreciative engineering companies. They can be used to create another focus and language about what to design in engineering organizations.

In the following section the concept of appreciative processes will be discussed in order to identify principles that can be used for creating an appreciative product development process.

3.3 Appreciative Processes

The previous section was concerned with the structural design of appreciative organizations. This section moves the perspective from organizational structures to organizational processes. That is, the design of the processes that are used within the structure to carry out the core task of the organization and to create value. This could be the process of designing a new chemical product.

The Design with a Positive Lens approach inspires to design organizational processes differently than they traditionally have been. The social constructionist perspective leads to an interest in the role the design questions play and the role of the process design. One source of inspiration is the Appreciative Inquiry 4-D Cycle that offers a generic process that can be applied in many different ways. This process can be developed by inspiration from the arts. This section will explore the possibilities for process designs that take their origin in Appreciative Inquiry.

3.3.1 The Role of Questions in Design

Questions are a fundamental element of doing design. This refers to all types of design, e.g. organizational design, process design, and product design. Designers imagine a desired future and aim at planning and specifying it while working in iterations. The work evolves in many small steps of trial and error, and in each step they look critically at the design object and attempt to assess the effect and contribution of the latest design iteration to their overall design objective. They enter a reflective conversation with the situation. The importance of asking the right questions is intuitively clear when realizing how questions both enable and constrain what will be explored, and how questions not being asked represent areas not explored. Questions are the seeds of the ideas and solutions to come. Therefore, an understanding of questions is fundamental to designers (Avital, 2002).

The ways of asking have a large impact on the answers to the questions. Avital (2002) uses the analogy that the catch of a fisherman is largely determined by where he looks and what tools he uses. In the same way the discovered requirement specifications in a product design are largely dependent on who has been asked, what, when, and in what way they have been asked. The nature of the inquiry determines both the process and the product of the design. Different modes of inquiry are expected to generate different design strategies, which are expected to yield different design blueprints.

Conventionally, designers tend to adopt a problem solving approach without giving any attention to the implications that this mode of inquiry have. It is generally taken for granted that design is a process of identifying and solving problems. The question of how the problem solving approach affects the process and product is rarely exposed.

Another mode of asking questions is Appreciative Inquiry. It is radically different from the problem solving approach, and it can be done while answering the call for design processes that are used in a social context, uses cross-disciplinary tools, takes a holistic approach, is responsive to human needs, and is responsible and ethical (Avital, 2002). Appreciative Inquiry assumes that the presuppositions, choices of method, and use of language creates the world that it later discovered. This means that the questions are fateful and that the first questions are the seeds of transformation. At the same time, the Appreciative Inquiry approach creates positive images that have a long-term inspiring capacity and holds a sustainable momentum for change. It creates innovation at the speed of imagination since instead of negation, criticism, and spiraling diagnosis, there is discovery, dream, and design. Fundamentally, the approach seeks to build a constructive union between people based on a positive change core that assumes that every living system has untapped, rich, and inspiring accounts of the positive.

A comparison between problem solving and Appreciative Inquiry as approaches in the context of design is shown in Table 3.3. The use of an Appreciative Inquiry based mode of

Table 3.3: Appreciative Inquiry Approach in the Context of Design (Avital, 2002).

Inquiry Character	Appreciative Inquiry	Problem Solving
Reality Picture	Socially Constructed	Given objective reality and Universal truth
Unit of Analysis	Groups and values	Structure and processes
Focus of Inquiry	Capabilities, strengths, possibilities, versions of a better world	Value chains, constrains, and discrepancies
Source of Wisdom	Draw from situated knowledge	Assimilate best practices
Generative Capacity	Conductive for insight and learning	Solve ad hoc problems within the prevailing paradigm
Perspective	Accommodating, constructive, faithful	Critical, deconstructive, cynical
Form of Communication	“Best of what is” and “What can be”	“As is” and “To be”
Organizational Image		
Thrust	Organizational transformation, learning, and development	Integration, efficiency, effectiveness, and control
Institution Role	Pluralistic/Life-giving	Purposive/Goal seeking
Agency Role	Interdependent Subject to social influence	Independant Subject to task and structure
Root metaphor	Organizing as a possibility to be embraced	Organization as a problem to be solved

inquiry as an alternative to problem solving may open new horizons and uncover new possibilities both for the design product and for the designing organization. Questions have a crucial effect on the process and the product, and a pursuit of great questions is critical in any product design.

3.3.2 Circular Questions

In this section the circular question technique will be introduced. This involves a discussion of two different realms of understanding, the lineal and the circular. The lineal realm of understanding or way of knowing is familiar, as it is the dominant way of knowing in a positivistic view. Lineal thinking is concerned with logics, cause-and-effect relationships, and a chronological understanding of time. Events can be arranged in time with a logical connection between them, and there is often an individual focus. This way of thinking is very useful for organizing and understanding complex systems, and it is very dominant in the field of engineering.

In a lineal question technique the approach is often first to ask clarifying questions and then questions that are aimed at influencing with good intentions such as advice and assessment.

The clarifying lineal questions are concerned with identifying cause-and-effect relationships that are part of a lineal time understanding where the past is behind and the future ahead. In this chronological logic it is possible to identify what happened first, second, and last. Actions and events add meaning to the subsequent actions and events. Actions are seen as reaction to other actions.

Another way of knowing and understanding can be used as a supplement. The circular realm of understanding introduces another useful way of knowing and questioning. In circular thinking the understanding of time is perspective. This means that every action and event should be understood in relation to preceding events as well as subsequent events. The actions that happen tomorrow add meaning to the events that happen today. Due to this perspective the circular thinking is concerned with exploring patterns and connections. This implies room for different realities with a polyphonic span of opinions and perceptions. Circular thinking leads to other types of questions than used in the lineal question technique. This involves hypothetical and expansive questions as well as relational and generating questions.

This focus on the different ways of understanding that can supplement each other might be very useful for design processes. Figure 3.4 shows the different types of questions plotted in a chart that shows their assumptions, intent, and key words about their nature. Apart from the types of questions presented here, it might also be valuable to recall the discussion about generative questions from section 2.3.2.

Bjerring and Lindén (2009) offers four quite describing labels to the four question types: The clarifying questions are asked by the detective, the expanding questions are asked by the exploring anthropologist, the generating questions are asked by the visionary futurologist, and the strategic questions are asked by the captain.

In problem solving the approach is lineal with the first questions being clarifying and the last being strategic. This clarifies the problem and clarifies what to do subsequently, but this approach does not create much development. The circular approach is much more developing. Positive design should be based on using all four question types. First, the clarifying questions to get to the facts, then the expanding questions to search for relations, patterns, and different views, third the generating questions to create new possibilities and thoughts about a hypothetical future, and finally the strategic questions that clarify action based on the expanding and generating answers rather than just the clarifying questions.

In addition to using both the lineal and the circular questions, there is another dimension that should also be used wisely. This is the problem focus or resource focus dimension. The Appreciative Inquiry approach favors resource focus over problem focus when inquiring about the desired future. This should also be reflected in the questions asked. Resource focused questions of the lineal type could be about what already has been done to improve

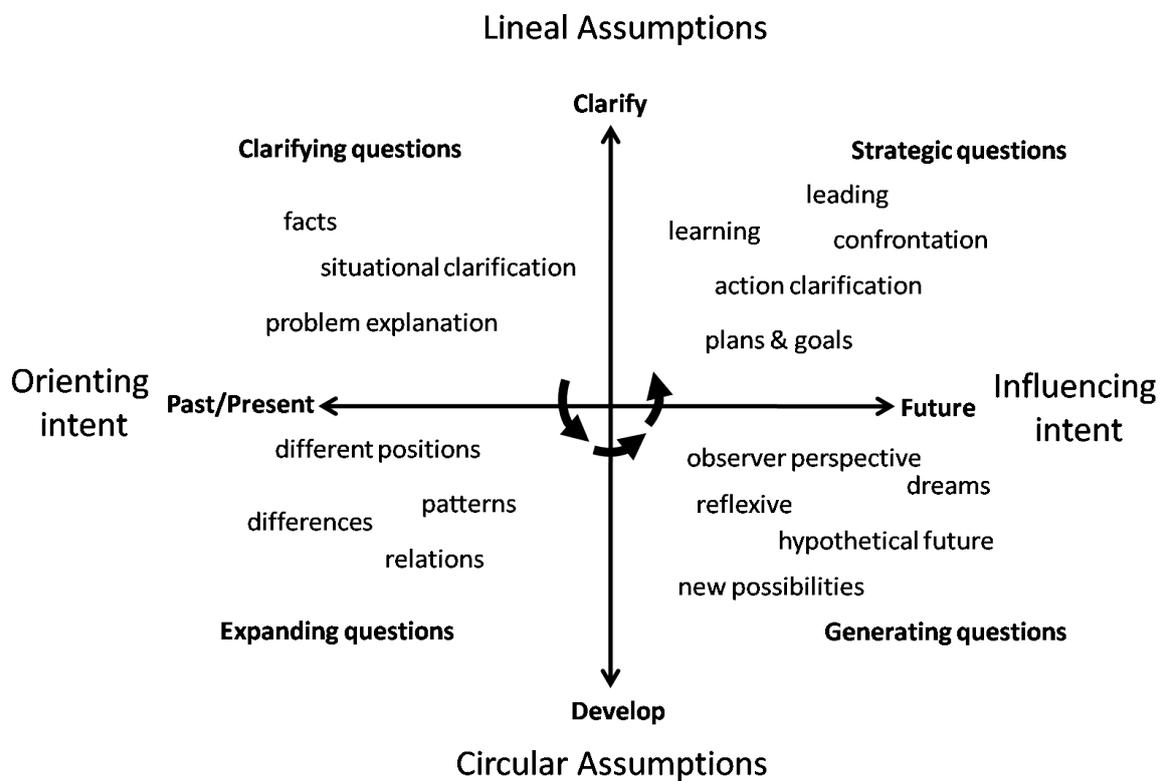


Figure 3.4: Four question types, their assumptions, intent, and characteristics (inspired by Tomm, 1988; Brown, 1997; Haslebo and Lyndgaard, 2008a).

the situation, and of the circular type be about who the most supportive people could be. Problem focused questions of the lineal type could be about what has failed already, and of the circular type about what could be wished differently in the situation.

This description of different question types and their different possibilities gives a new perspective to the use in product design. Instead of only using problem focused lineal questions, there is a huge potential in also using circular and resource focused questions, as well as generative questions as described in section 2.3.2.

3.3.3 The Appreciative Inquiry Process

The design of the traditional Appreciative Inquiry process is captured in the 4-D Cycle as presented in section 2.3.1. First, the scope and theme is determined, which is called the definition phase in some versions of the process. Then, the process leads through the four phases of Discovery, Dream, Design, and Destiny. The phases relate to each other and are not very effective if not carried out together. The idea behind the cycle is to identify the already existing positive core of the organization in the Discovery phase and then use the positive energy to elevate the core with new ideas that really matter in the Dream phase. The great dreams are then connected to each other and it is designed how they should be in the Design phase. Finally, the propositions from the design phase are prepared to be carried out in the destiny phase where people take responsibility for action.

Definition. Before the 4-D Cycle is carried out, it is necessary to choose an affirming topic and scope for the process. Most interventions are carried out either to solve problems or to implement new ideas. It is a basic assumption in Appreciative Inquiry that inquiry is intervention, i.e. there will be created more of the thing in focus of the intervention. Because of this, it is important to select a target for the process that is affirming, and thereby will create a positive impact merely from doing inquiry into the topic, and would be motivating for people to reach after. The topic can also be developed during the Discovery phase and crafted an engaging appreciative question.

Discovery. The purpose of the Discovery phase is to identify the many facets of the positive core of the organization, its members, and its stakeholders. This includes resources, competencies, and experiences that people bring from the past. The goal is to collect data about the largest potentials present while energizing the organization's members. The key steps in appreciative data collection are identified by Cooperrider et al. (2008c):

1. Identify Stakeholders.
 2. Craft an Engaging Appreciative Question.
 3. Develop the Appreciative Interview Guide.
-

4. Organize the Collection of Data:

- How will the findings be used?
- How will the findings be recorded?
- How will the team's data be compiled?
- How will the data be reported?
- Who will be responsible for collecting and organizing the data?

5. Decide how and when interviews will be conducted

6. Conduct interview

7. Make sense of inquiry data.

One of the key elements of a successful discovery phase is the appreciative interview that enables people to tell stories about their peak experiences and high points. This is both in relation to themselves, to the selected topic, and to the desired future. The topic questions are usually very generative and they change the perspective and makes the interviewee think about the topic from new views (Cooperrider et al., 2008c).

Dream. The purpose of the Dream phase is to envision the greatest potential in the organization based on the stories from the Discovery phase. This is the time to push the creative edges of the positive possibilities. It is the time to wonder about the greatest potential. Many of the best dream activities take place just after a successful discovery phase and start by some energizing activity or play. Often there are lots of people involved in the activity, and they get engaged in sharing their dreams and creating a collective verbal picture of their desired future. The dream activities are based on elevating questions that generates rich and creative dream dialogues. The Dream phase is a journey of mutual discovery of broad themes and many voices. It is not an analytical task or a search for one best idea, but rather an exploration of life-giving forces that contribute to the organization's success.

The success of the dream phase is often based on the energy that has been built up during the Discovery phase and the participants' use of this to reach a shared vision. The vision consensus is often very strong because the vision is grounded in examples of the organization's past. It cannot be questioned whether the vision is achievable since the participants already have demonstrated their ability and willingness to make it happen. The Dream phase is about creation of energy, excitement, and synergy while identifying the common life-giving forces of the past, that are used to enable envisioning about the future of the organization (Cooperrider et al., 2008d).

Design. The purpose of the Design phase is to design how the vision can be made real by determining the ideal. In organizational transformation interventions, the target is often a transformation of the social architecture, i.e. the organizational structure, design, and

processes. The target for the design phase can also be something else such as a new product. Cooperrider et al. (2008a) propose the following four design steps:

1. Select Design Elements.
2. Identify Internal and External Relationships.
3. Identify Themes and Engage in Dialogue.
4. Write Provocative Propositions.

When choosing design elements, a well known organizational framework can be used or the participants can choose whatever makes sense in their particular situation, e.g. including the facets of appreciative organizations introduced in section 3.2.5.

The use of provocative propositions is a useful approach to creating transformation since it bridges the positive dreams and thoughts about the future. Just as introduced with the design attitude (Boland and Collopy, 2004) in section 3.1.1 the Design phase of Appreciative Inquiry can be inspired by the artistic approaches to organizational design such as improvising, sketching, iterations, visual mapping, cross-disciplinary connections, and shifts between divergent and convergent modes (Cooperrider et al., 2008a).

Destiny. The purpose of the Destiny phase is to ensure that the dream can be realized. This means that the organization should be aligned with the provocative propositions created in the Design phase, and that appreciative learning competency should be built into the culture. Like the other phases this one is systematic in terms of accommodating and continuing dialogue. This means that provocative propositions can be reviewed and revised, and new appreciative interviews can be carried out if desired. The methods used in this phase are often based on self-organized groups resembling Open Space Processes (Owen, 2008). This is the time for people to take responsibility for what they feel energized about, and the time for continuous organizational learning, adjustment, and improvisation.

An important task for all organizational leaders is to create a culture where people can explore, experiment, extent capabilities, improvise, and anticipate unspoken costumer-needs. This can be labeled appreciative learning cultures and leads to innovative thinking, a positive focus, a sense of meaning, and systems that encourage collaboration. While the problem solving approach emphasizes a dispassionate separation of observer and observed, the appreciative approach is a passionate journey which involves emotional energy to create a positive image of the desired future (Cooperrider et al., 2008b). This shift happens during the 4-D Cycle where the members develop their skills in appreciating what works well and gives life in the organization, and also participate in generative conversations that elevates the capacity of the process (cf. section 2.3.2). The goal is to create an improvisational capacity of affirmative competence, expansive competence, generative competence, and collaborative competence (Cooperrider et al., 2008b).

3.3.4 The Appreciative Inquiry Summit

Appreciative Inquiry can be used in many different processes. (Ludema et al., 2003) suggest the following forms of engagement when using Appreciative Inquiry:

- **AI Summit.** A large group of people (30-3,000) participate simultaneously in a 3-5 day AI 4-D process.
- **Whole-System 4-D Dialogue.** All members of the organization and some shareholders participate in an AI 4-D process that takes place at multiple locations over an extended period of time.
- **Mass Mobilized Inquiry.** Large numbers of interviews (thousands to millions), on a socially responsible topic, are conducted throughout a city, community, or the world.
- **Core Group Inquiry.** A small group of people select topics, craft questions, and conduct interviews.
- **Positive Change Network.** Members of an organization are trained in AI and provided with resources to initiate projects and share materials, stories, and best practices.
- **Positive Change Consortium.** Multiple organizations collaboratively engage in an AI 4-D process to explore and develop a common area of interest.
- **AI Learning Team.** A small group of people with a specific project - an evaluation team, a process improvement team, a customer focus group, a benchmarking team, or a group of students - conduct an AI 4-D process.
- **Progressive AI Meetings.** An organization, small group, or team goes through the AI 4-D circle process over the course of ten to twelve meetings that are each two to four hours long.

The Appreciative Inquiry Summit is a particularly effective way of doing Appreciative Inquiry (Ludema et al., 2003; Cooperrider et al., 2008f). Because of this the process will be described more in details. The large summit is very useful as a frame around the process due to its ability to engage a large group of people at the same time. The Appreciative Inquiry Summit (AI Summit) is a large-group process for accelerated change that is built on the powerful ability to transform that Appreciative Inquiry has shown. It is based on the study and exploration of what gives life to social systems when they function at their best. The AI Summit uses the energy that comes from positive discovering to construct and co-create a desired future. The AI Summit is one of many ways to use Appreciative Inquiry to promote positive change in organizations or communities, but it is advantageous due to its power to get everyone involved, strengthen relationships, and quickly produce remarkable results (Ludema et al., 2003).

The AI Summit can produce accelerated positive change by involving a large number of internal and external stakeholders in the change process. It can be planned as a single

event or a series of events that bring people together to discover the organization's core competencies and strengths, to dream and envision opportunities for positive change, to design desired changes to the organization's systems, structures, strategies, and culture, and to implement and sustain the change and make it work over an extended period of time (Ludema et al., 2003).

The AI Summit can be held with any number from tens and up to thousands of participants. Ludema et al. (2003) state that when the summit gets closer to include the entire system, the positive change will be more dramatic and sustainable. The methodology assumes that organizations develop fastest and best when its members are excited about where they are going, have a plan on how to move forward, and are confident that they can reach their desired destination. The entire system should be aligned around its strengths and ideas that generate energy for action.

The Summit Task. One of the most important activities before the summit is to identify a relevant and compelling task that carries energy, focus, and potential. The task has to be an affirmative call to action. Effective tasks are actionable, energizing, engaging and can draw the attention of the entire organization.

The Participants. Selection of participants to the summit needs to be holistic. The AI approach is holistic and draws on knowledge from the participants as well as it relies on the participants to carry out the change. Therefore, the participants ideally consist of every member of the organization as well as stakeholders along the entire value chain. Sometimes this is not possible, i.e. if the organization has activities that cannot be shut down or if geographical or logistic issues does not allow everybody to be gathered. In these cases at least all stakeholder groups from all levels and functions of the organization should be represented.

The Summit Design. It is necessary to create a customized design for every AI Summit, and it should be done by the entire planning team. By doing this the planning team gets ownership, learns more about the process, and the design can be fitted to the context and the organization. By carrying out the planning sessions as a smaller summit-like two-day meeting the design can be made while learning-by-doing and utilizing the rich energy, ideas, and engaging conversations that are created with the AI Summit methodology.

Carrying out an AI Summit. The AI Summit uses the 4-D process to engage the task. The assumptions behind the methodology are appreciative and therefore allow the participants to engage the issues that they find meaningful and energizing. A large-group process that can get so much positive momentum as an AI Summit cannot and should not be controlled. Instead, the planning group should orchestrate and facilitate the sessions by energizing participants and helping them on track and getting focus.

Discovery. In the discovery phase of an AI Summit the focus is on exploring the many facets of the positive core of the organization. This includes discovering who everybody is individually and collectively, what resources everybody brings, and what core competencies that are present. It also includes questions such as what hopes and dreams we have for the future, what the most hopeful macro trends that are impacting at the time, and how we can imagine to move forward together. Specific activities can include (Ludema et al., 2003):

- Setting the task focus. A brief introduction to the context and purpose of the summit.
- Appreciative interviews. One-on-one interviews around the topic of the meeting.
- Who are we at our best. Small groups recollect highlight stories and best practices from the interviews.
- Positive core map. A large-group process that illustrates all the strengths, resources, capabilities, competencies, and positive hopes, feelings, relationships, alliances, and other assets of the organization.
- Continuity search. A large-group process to identify factors that are desirable in the future by creating organizational, industry, and global timelines.

Dream. The dream phase is all about envisioning the greatest potentials in the organization for positive influence in the world. In many cases facilitation by good questions and processes are beneficial to enable and stimulate the creativity. Possible questions can be such as: Imagine you wake up five years from now and look around, and you see the organization just as you have always wished and dreamed it to be. What is happening? How is the organization different? Specific activities during the dream phase can be one of these three alternatives (Ludema et al., 2003):

- Creative Dreaming. A method of creating new possibilities that attract and inspire organizational action.
- Opportunity Mapping. A method of mobilizing action around a specific set of key opportunities.
- Consensus Visioning. A method of coming to consensus about a purpose, mission, or vision for the whole organization.

Design. In the design phase the goal is to create an organization where the positive change core is alive in all its strategies, processes, systems, decisions, and in all collaboration. In this phase affirmative design statements are crafted that should create a bridge between the organization's positive core and its dreams. The design statements are sometimes called provocative propositions and should be visionary proclamations that reflects the best of who they are and aspirations for who they want to become. They should be calls for action and represent the organization's commitment to move in the direction that is described. Specific activities in the design phase can include (Ludema et al., 2003):

- Creation of organization design architecture. Identification of the design architecture best suited for the organization in its current context, business and industry.
- Selection of high-impact organization design elements. Selection of high-impact design elements based on interviews and dreams from the earlier phases.
- Crafting of design statements for each organization design element. Small groups write design statements that incorporate the positive change core into the design elements.

Destiny. The final phase is an invitation to action. This is where groups are to work on the specifics on what will be done. This is an invitation to personal initiative, group initiative and self-organization. The goal is to support those who choose to go forward on behalf of the whole by demonstrating the large groups commitment to action. Specific activities may include (Ludema et al., 2003):

- Generation of possible solutions. Small group brainstorming of possible actions that are later shared in the entire group.
- Selection of inspired actions. Individuals and small groups publicly declare their intentions for action and specify what support and cooperation they need.
- Formation of innovation teams. Groups meet to plan how to do the next step for cooperative innovation.

After a Summit. After a summit there is still a lot of things to do to ensure follow up on the things that needs to be carried out. There is also a need for continuous support for building an appreciative organization. Six areas for follow up are mentioned by Ludema et al. (2003):

1. Communicating outcomes
2. Supporting innovation teams
3. Supporting improvisational initiatives
4. Recognizing people working in new ways
5. Furthering the use of Appreciative Inquiry

3.3.5 Inspiration from the Poetics

Poetry, sculpture, and other fields within the arts inspire to develop the appreciative inquiry process. As discussed by Whitney (2008) in section 3.2.5 the language can be an important creator in organizations. In this section the appreciative inquiry process is discussed through the lens of poetics. This is an example of how the arts can inspire to create new innovative ways as described by Adler (2006) in section 3.2.4.

In an Appreciative Inquiry initiative the first two phases are in a diverging stage that builds on the creativity and energy that the collaborative exploration of the strength-based approach creates. It is based on a narrative and poetic language. In the last two phases of design and destiny a shift occurs where the approach is instead converging and build on a logico-scientific language and rationale where discussions about organizational design and activities for the future are planned. Zandee (2008) argues that it is logical to make the shift from divergent to convergent; from discovering strengths and lofty ideas to ways of organizing that makes the former actionable and attainable. But this also represents two different ways of knowing and talking. First the narrative and poetic way and second the logico-scientific. The narrative mode of knowing gives meaning to the lived experiences and shows the possibilities in organizational life through contextual and concrete examples. The logico-scientific mode gives voice to reason and allows dissecting and categorizing rich information into abstract models of reality consisting of manageable decontextualized parts. Examples of logico-scientific linguistics of knowing are factual reports, bullet point presentations, and action lists.

While the experimentation with and value of the positive narrative discourses as well as the use of non-prosaic language in Appreciative Inquiry has been well documented for its ability to unleash the capacity for change in organization systems (cf. chapter 2), it has been surprisingly compliant with the dominant use of logico-scientific discourse when dealing with the final two stages. Appreciative Inquiry uses the term social architecture for the formal organizational elements such as systems, structures, strategies, processes, job descriptions, workflows, and so on (Cooperrider et al., 2008a). Groups are usually asked to redesign the existing social architecture to enable the organization to realize the new dreams. This is usually done by using well-known frameworks or by selecting crucial design elements. For each step the group takes into the converging stage some of the rich meaning found in the life carrying organizational stories and evocative dreams of future images get diluted as the discoveries in the narrative mode gets translated into a rational, pragmatic form of organizing. Especially when well known frameworks are used or when project assignments have to be divided, the rationale and logics of common managerial practices influence the thinking into categorization rather than creativity and life giving possibilities.

Zandee (2008) argues that Appreciative Inquiry becomes more radical in its development if the narrative mode is carried forward into the converging phases. This can lead to more humane and poetic ways of organizing that can enable the necessary fanciful alternatives for our organized existence. This approach uses poetic principles and an aesthetic lens to look at how words may inspire worlds while understanding the qualities of stories and other evocative forms of linguistic expression. Four characteristics are identified for poetic language that gives its qualities for creating. The characteristics are imaginative, ambiguous, touching, and holistic. These qualities stand in contrast to usual design principles such as efficiency and

expediency. It also stands in contrast to modernistic organizations that have developed to be stable, predictable and controllable, leaving little space for imaginative creativity that may induce change. A prevailing expectation of managers as decision makers creates a need for rational behavior in order to streamline daily operations (Boland and Collopy, 2004). Along with the desire for efficiency this is holding back possibilities of renewal of the organization. Zandee (2008) asks us to imagine the converging conversations of Appreciative Inquiry being guided by the poetic principles of imagination, ambiguity, touch, and holism. What kind of questions will be asked about the ideal organizational design? How will the resultant organizations look like?

Zandee (2008) states that a belief in the power of imagination will lead to conversations about the design of organizational playgrounds, of physical and virtual spaces in which adventurous thinking, dreams, and anticipatory learning can flourish. When nurturing the process of imagination is considered more important than short-term outcome, it will be realized that even the most compelling affirmation is only temporarily relevant, and that a need for continuous questioning is necessary and a search for ways to keep organizational thinking forward moving. If ambiguity is welcomed for its potential to stimulate learning and creativity, design should emphasize variety by leaving roles and tasks underspecified and by creating overlaps and gray areas in responsibilities. Such organized vagueness necessitates that things are being figured out by everybody and a need to meet for questioning and enrichment of practice. Ambiguity becomes opportunity for renewing exploration in the context of trusting relationship. Organizational environments that are designed for aesthetics may induce a touching appeal that make the members feel at home and truly present in spontaneous interactions. Organizational design that nurtures a holistic principle might be done by making relationships prime and by creating contexts in which organizational participants “sense not just responsibility for but feel an intimacy with the whole” as described by Cooperrider and Avital (2004).

These poetic design principles of imagination, ambiguity, touch, and holism invites to combine an open, inquiring mind with a sense of caring, interdependent relationship. In balancing interplay, they make it possible to escape the status quo of habitual organizing without tearing the connective tissue that holds organizations together. They make it possible to deal with confusing situations in confidence-inducing reciprocal interactions and to trust gut feelings when deciding together on unknown futures. They also make it possible to undertake our personal endeavors from an intimate understanding of our belonging to a much larger and more important whole (Zandee, 2008).

The same is probably also true in relation to conventional engineering processes that only utilize a logico-scientific language. These processes could be developed in order to incorporate the possibilities that the poetic and narrative rich language creates. This point might be valuable to consider when developing an appreciative process for chemical product devel-

opment.

3.3.6 Inspiration from the Theory of Sculpture

Faust (2008) has explored the positive design approach by using in a comprehensive theory of sculpture design. By doing this it was possible to take advantage of design lessons from the arts. The positive lens metaphor is inspired by positive psychology that has shifted away from the study of dysfunctions and towards the study of and encouragement of human strengths. In the context of design this means that the attention is shifted away from focus on detection, correction of errors and the control of chronic problems and instead towards the emphasis on the capacity to design better organizations, products, and technologies. It builds on the belief that this approach can avoid the trap of reinforcing chronic dysfunction, and instead give life to a positive imaginative horizon. The positive language and metaphors are powerful generators of the outcomes as they show the possibility of positive outcomes from the design efforts and thereby catalyze actions to reach the outcome (Faust, 2008). This shows that the design process will affect and interact with both the organization and the product being designed.

Faust (2004) describes a theory of sculpture with two different generating processes. In the first process all objects, conditions, and social systems are considered as always being in motion. They change without adding or subtracting from their totality. The first generative process is recognized as living change where the changes are appearing from the inside and not forced by the environment. The change from one stage to another goes through periods of movement and chaos. The new order is triggered through warmth, flexibility and interest. In nature an example of the first generating process is the change of an element in the chaotic gas phase changing into liquid and later solid phases with the conservation of mass.

The second generating process is a change due to addition and subtraction in order to reach a new shape. This can happen continuously or in stages. The stages are achieved through processes that address internal limitations of the object or condition. The organization does not have the internal energy and desire to change and is forced to do so by the environment and outside forces. In nature an example of the second generating process is a material that is not molded through internal fluidity but is rather grinded, fractured, bursted, or broken into its shape by the environment. Faust (2004) designates this cold energy and negative forces, since the shaping does not come from inside initiatives. The two different generating processes are illustrated in Figure 3.5.

Design with a positive lens recognizes the importance of the first design phase. It also realizes that a design process has various phases, and that different starting points can be taken as well as different movements of generating processes. Faust (2004) identifies several important questions: Is it possible to keep a design project within the first generating process? Is it

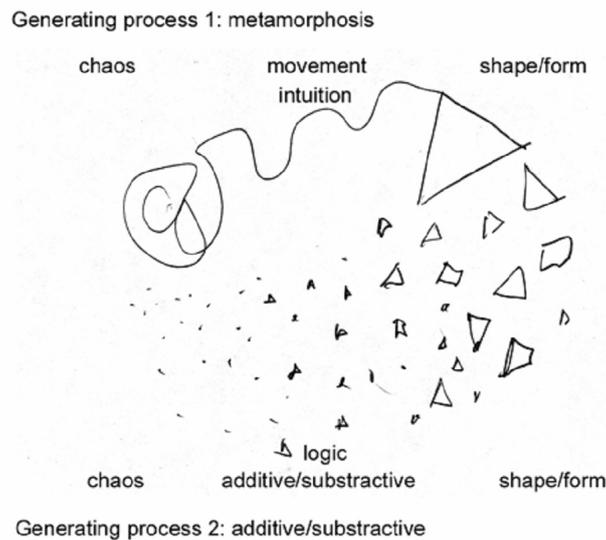


Figure 3.5: Theory of sculpture (Faust, 2004).

desired, and if not when should the second phase be used instead? Is it possible to circumvent an iterative process and have a design process without dissecting the proposed solution and still enhance the quality of the design solution?

Faust (2004) compares the traditional design process with Appreciative Inquiry in the perspective of the theory of sculpture. The traditional design process can be described with the following steps:

1. Problem analysis
2. Design brief
3. Investigation and research
4. Generating solutions
5. Evaluating and selecting
6. Prototyping and testing
7. Production and implementation

This process features steps that can be recognized differently by the two different generating processes, and can be interpreted within the theory of sculpture as seen on Figure 3.6. Appreciative Inquiry on the other hand has a focus on the possibilities that exist in the first generating process. Its four phases of Discovery, Dream, Design, and Delivery are positioned in the theory of sculpture as shown on Figure 3.6.

Design with a Positive Lens can learn from Appreciative Inquiry that is developed to contrast with the Problem Space of the traditional approach. It is a great way to start a design process in the generating phase with its positive and energizing approach. But Faust (2004)

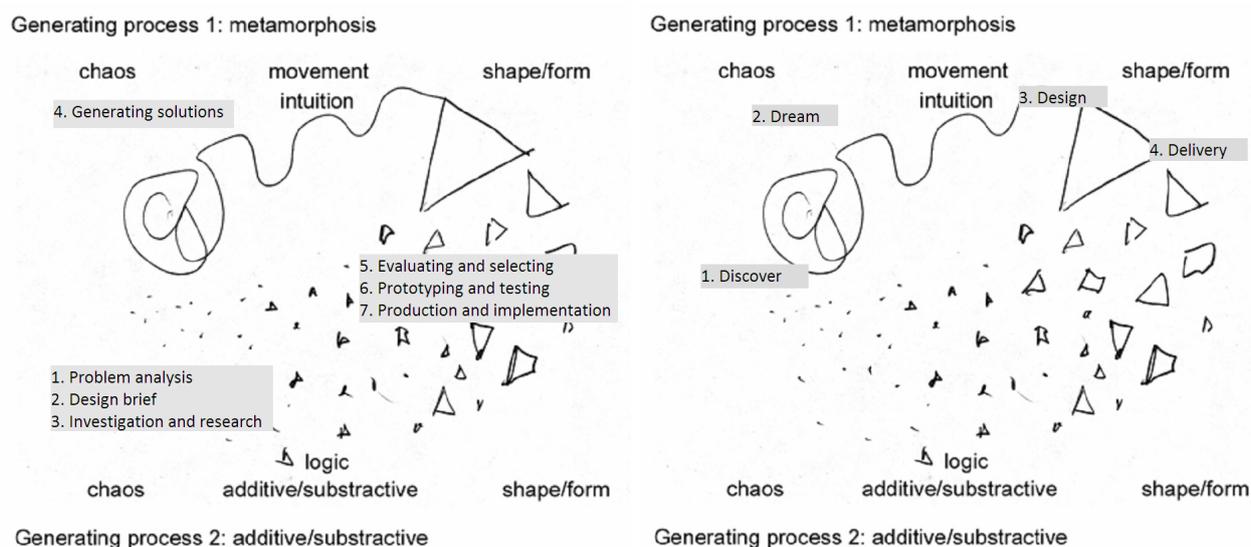


Figure 3.6: Left: Traditional design process in the theory of sculpture. Right: Appreciative Inquiry in the theory of sculpture (Faust, 2004).

argues that Appreciative Inquiry has not yet developed into a comprehensive concept of design to guide it through generation, evaluation, and implementation of alternative designs. Designing with a Positive Lens needs to take into account that all phases of the design process are equally important and that both generating processes add a value. There is no forming of a design without a force from outside. Each entity lives by outside and inside forces, and only a balance between the two creates a lively design. Selection and iteration are important aspects of delivering the best possible solution, and these aspects as found in the second generating process of the theory of sculpture need to be taken into account in the process of Design with a Positive Lens. It is also clear that the strength of Appreciative Inquiry is a very giving starting point of a design process. By taking this into account and by realizing the need for using the cold energies in the iterative phases of selecting and evaluating, a new design process can be described in the theory of sculpture as shown in Figure 3.7 (Faust, 2004).

This design process could be suited for appreciative engineering purposes.

Avital et al. (2006) propose to use the theory of sculpture in order to address the issue of a need for criticism in positive design. They propose that before a new shape can emerge in a design process, there must be movement, and before movement there must be a sense of chaos that allows movement to happen. Chaos can lead to movement and movement can lead to new shapes, but without criticism there can be no chaos in design processes and thereby no movement and no new shapes. This stresses the need for constructive criticism within positive design. They also propose that humor can have a critical front that can break familiar mindsets and could be one way of allowing the creation of chaos while still being in the positive and appreciative domain.

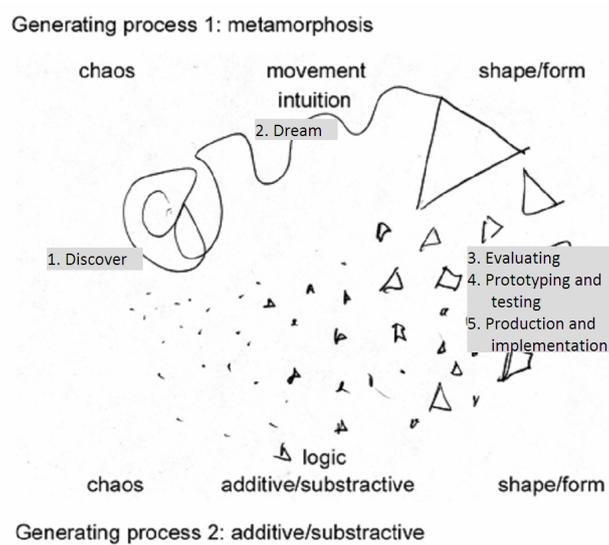


Figure 3.7: A Positive Lens Design Process in the theory of sculpture (Faust, 2004).

3.3.7 Evaluation and Learning

Two subjects that should not be forgotten when discussing processes are evaluation and learning. Most processes formally end up with evaluation. I want to introduce the concept of Appreciative Evaluation that might be a useful approach to optimize learning and knowledge sharing.

The purpose of Appreciative Evaluation is to identify the positive core of the activity or project which is evaluated, as well as opportunities for improvement in the future. Opposed to evaluation based on the problem solving approach that focuses on minimizing mistakes in the future, Appreciative Evaluation recognizes the value of identifying elements of success that should be sustained as well as identifying opportunities for further development. The problem solving approach searches for mistakes and corrects them, but this rarely leads to innovative solutions in the same way as an explicit search for new opportunities can do. This has led to the development of the concepts Valuation and Feed Forward. The first meaning appreciating the process, and the latter meaning input on how to improve in the future (Haslebo and Lyndgaard, 2008a).

In one method of Appreciative Evaluation feed forward is given with three different perspectives: Summarizing perspective, generative perspective, and adjusting perspective (Bjerring and Lindén, 2009).

Summarizing Feed Forward. The purpose of the summarizing perspective is to identify and recognize what has been valuable and positive that should be sustained and used another time. This may be through questions such as “when did you learn the most?”, “what experiences did you get?”, and “what should be repeated if this activity should be used

again?”

Generative Feed Forward. The purpose of the generative perspective is to elaborate on what has happened and generate new input that could lead to new possibilities in the future. Examples of questions are: “What new thoughts has been generated during the process?”, “what new possibilities have been realized?”, and “how would you imagine the best results three months from now?”

Adjusting Feed Forward. The purpose of the adjusting perspective is to identify the elements that can be adjusted in order to develop for the future. Examples of questions are: “Is there anything you would have wanted more of in the process?”, “is there anything that could be left out next time?”, and “what have you experienced somewhere else that could be valuable to use next time?”.

Appreciative Knowledge Sharing. Knowledge sharing is a key element in organizational learning. The appreciative approach has a potential for knowledge sharing because it is prospective rather than retrospective. Thatchenkery and Chowdhry (2007) describes how Appreciative Inquiry can be used for knowledge sharing and summarizes the assumptions in Table 3.4. For more information see Thatchenkery and Chowdhry (2007).

3.3.8 Inspiration for Chemical Product Development Processes

This chapter introduces many inspiring thoughts that can be used in chemical product development. Since the aim of the report is to develop a new process model for chemical product development the most inspiring perspectives from the chapter will be summarized in this section.

The managing as designing perspective addresses the need to focus on the design process rather than the decision process. Decisions should not be made prematurely without having the right information available; the task for managers is rather to enable good processes. For chemical product development this means that management should focus on creating a good process rather than having the right decision gates.

The Design with a Positive Lens perspective describes the importance of the design approach and design question for the outcome of a design process. This perspective address that the problem-solving approach might not be suitable for all the applications it is used for. A positive and appreciative approach might be more useful for tasks that involve teamwork and innovation. The perspective also states the importance of asking the right questions, and that the used language can determine the arena for the answers. This means that a new appreciative process for chemical development should address the need for an appreciative design approach as well as a focus on asking the right questions.

Table 3.4: Contrasting retrospective and prospective approaches to knowledge management (Thatchenkery and Chowdhry, 2007).

Retrospective	Prospective
<ul style="list-style-type: none"> • Problem solving • Identification of a problem • Highlight what is broken • Identify knowledge management problems • Analyze causes • Generate possible solutions • Action planning and treatment • Fixing as intervention • Looking at what is missing • Knowledge management as a problem to be solved • Degenerative diagnostics focus • Reactive, knee-jerk response • Focus on what's urgent • Leverage learned helplessness • Passive, cognitive, re-affirmation of status quo and current reality • Modernistic • Reductionistic • Defensive routines • Managing from the past 	<ul style="list-style-type: none"> • Appreciative Sharing of Knowledge • Valuing and appreciating "what is" • Affirm what is working • Identify knowledge enablers • Envision what is possible • Generate future-present scenarios • Innovation/realizing what will be • Affirmation as intervention • Looking at what is present • Knowledge management as an opportunity to be embraced • Generative prognostic focus • Proactive, reflective response • Focus on what's important • Leverage learned optimism • Active, intentional cognitive reframing of current reality • Postmodern • Social constructionist • Open communication/dialogue • Managing for the future

The question methodology is further expanded by introducing the concept of circular questions that are not based on a lineal realm of understanding but rather a circular one. By embracing this question technique the design process gets new possibilities of creating generative questions that can lead to generative answers. This can improve innovation possibilities in product development.

The basic Appreciative Inquiry 4-D Cycle process has also been presented. It shows a well developed process for creating positive change. It could be embraced as a process for engineering with minor adjustments. Some of the adjustments are proposed by inspirations from the arts. Poetics can inspire to use more narrative rich language during the design process instead of only a logico-scientific language, and a theory of sculpture can inspire to also include a more logics based and subtractive generating process to shape the outcome of a design process. In practice this means that the appreciative approach is useful in most of the design process but that it is necessary to also include more technical engineering methods in phases such as evaluation, prototyping, testing, production, and implementation. By incorporating these adjustments Appreciative Inquiry seems suitable for use in an engineering design process, such as chemical product development.

Finally, four tensions are interesting to incorporate in design processes. The tension between deficit thinking and appreciative thinking is important to shape the outcome. The tension between uniformity and pluralism, i.e. the formal, efficiency-seeking processes and organic, adaptive, and flexible design processes is important to create a balance between the decision attitude and the design attitude. The tension between close-ended design and open-ended design is interesting to discuss to set up the boundaries and roles of the designers. The tension between locally-oriented design and globally-oriented design can create new opportunities in the globalizing world.

These remarks state how the appreciative approach and the positive design perspective should be incorporated in the design of a new process for chemical product development.

Task: Business Sustainability

Organizations that invite Appreciative Inquiry into their core get transformed and start inquiring how they can create a positive difference in the world. As Adler (2006) describes they search for significance not just success. The question this chapter is concerned with is how the role of the task, the strategy, or even the purpose of an organization is influenced by using the appreciative realm of understanding. How should companies develop to align with the thoughts that evolve from Appreciative Inquiry?

The chapter will start with a discussion of the trends in the appreciative perspective that influence the purpose of organizations, then introduce the concept of Business as an Agent of World Benefit that builds on Appreciative Inquiry, and finally discuss what this implies for the future of chemical engineering.

4.1 Appreciative Inquiry Transforms the Purpose of Organizations

Appreciative Inquiry is basically a process for change management which can be used for any specific purpose. Yet, as shown in the previous chapters the implications of using this realm of understanding have lead to many new perspectives, e.g. how leadership is viewed (cf. section 2.1.3) and how organizations are designed (cf. section 3.2). The ways of thinking

that have followed Appreciative Inquiry and evolved in organizations have also transformed the way many organizations view themselves and form their purposes, as well as the ways they cooperate across organizational boundaries.

4.1.1 Positive Meaning

Appreciative organizations are concerned with creating positive meaning in their work. This often results in extraordinary individual and organizational outcomes (cf. section 2.1.3).

When appreciative organizations involve their employees in creating new appreciative strategies, they often end up with a purpose that aims at enhancing the world around the organization (Cooperrider et al., 2008d). This tends to increase motivation and make people accomplish great things. An example illustrates the role positive meaning can have. A group of people were hired to clean up a nuclear arsenal in the Rocky Mountains and in a way work themselves out of the job. A focus on the long term effects of a successful accomplishment created profound meaningfulness for the workers. The dangerous location would become a wildlife refuge if they were successful. This resulted in high motivation and a remarkably quick time frame, low budget, and high cleanliness standard (Cameron, 2008). The example illustrates the potential of positive meaning in terms of motivation as well as performance.

The Swedish think-tank Kairos Future has investigated young Scandinavian people born in the 1990's. The young people were found to be very individualistic at the personal level and very collectivistic about society. Due to this duality they have been termed the MeWe-generation (Lindgren et al., 2005). These up-coming and potential employees have been young during global themes such as 9/11, the tsunami in East Asia, wars in Iraq and Afghanistan, the swineflu pan epidemic in 2009, and global climate changes. They are very aware of global affairs and want to contribute to the solutions. They have been achetyped as heroic by Howe and Strauss (2007). Companies that can offer meaningful work will probably be more successful in hiring, motivating, and retaining this generation of young people.

Positive meaning is therefore likely to both motivate people to great achievements and to attract the potential workforce of tomorrow. In this view it makes sense for appreciative organizations to develop a meaningful purpose. Every activity throughout the organization should add value to the purpose and the purpose should add value to the activities. For chemical engineering companies this view offers an interesting potential because of the meaningfulness in sustainability that chemical companies have been working with for decades. A focus on sustainability and its meaningfulness can be potent for chemical companies in motivating people.

4.1.2 Encouraging Dialogue and Cooperation

Appreciative Inquiry is by nature dialogue-seeking and it engages stakeholders in a search for knowledge and partnerships. In business programs leaders get plenty of education in negotiation skills but lack the skills for engaging in the dialogue for partnership (Gitsham, 2009). The appreciative approach is a shift compared to traditional tough business management. Kanter calls one of the tough management styles for cowboy management which stresses competition and rivalry over cooperation (Kanter, 1991, in Kamata, 2002). This competitive approach can lead to unfortunate results such as paying too much attention on beating competitors instead of doing well, creating mistrust between people because of friendly competition, as well as inferior performance due to anxiety. The alternative is appreciative leadership that embraces the possibilities in partnerships, sees sustainability as business opportunities in disguise, and has an overall purpose in elevating the life of human beings.

In the Design phase of Appreciative Inquiry there is an open search for both internal and external relationships (cf. section 3.3.3). This is a call for cooperation and partnerships. By actively seeking the opportunities that exist in other organizations' competencies the appreciative approach creates new business opportunities.

As an example, Kolind (2006) describes how a Danish pump manufacturer a few years ago changed their agenda from selling pumps to supplying clean water. This shift in purpose led to new opportunities for partnerships. They started up innovative projects in Africa where clean water was pumped up from the ground and sold by text messaging with a cell phone. The Danish company supplied the pumps and other companies supplied the other parts. He argues that companies are in a much more favorable position to create partnerships when they have a meaningful purpose.

In the same way chemical engineering companies can create new business opportunities by actively seeking cooperation and partnerships.

4.2 Business as an Agent of World Benefit

The focus on sustainability has increased the past years. A simple indication of this can be found by searching Google for the keyword "sustainability" and different years. Figure 4.1 shows how the amount of hits increases with the year. (Note that this method is only for an illustrative purpose).

The focus on sustainability is shown in the Corporate Social Responsibility (CSR) work of large companies. Traditionally CSR is seen as an investment for the company in order to

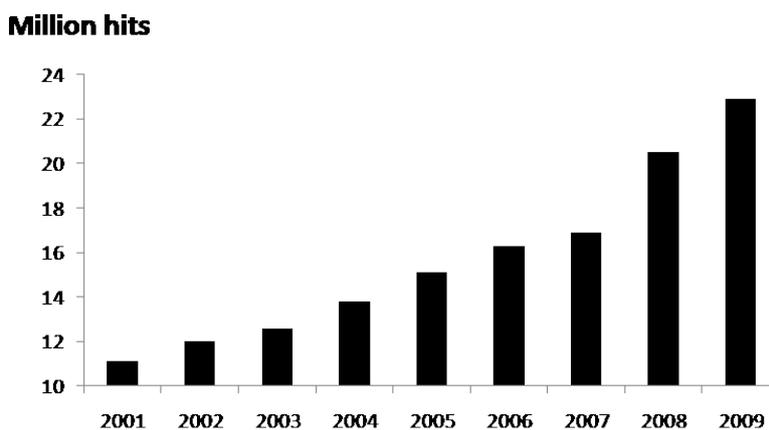


Figure 4.1: Hits in a Google search with the keywords sustainability and “year” (1/21/2010).

decrease the risk of bad publicity, but the appreciative approach has another view on it. As discussed in the previous section the appreciative perspectives often leads to a focus on how to obtain a positive impact on the world because it engages people to be a part of something meaningful. Kolind (2006) proposes that companies take meaning very seriously and search for an agenda in the world that they can contribute to. Not only does it give a lift in the internal engagement, it also gives new possibilities in terms of partnerships. The appreciative approach might lead to a shift in business models in order to create successful businesses; the discourse is to do well by doing good (Laszlo, 2008). Conventional business models where optimization of profit is the only overall purpose are being substituted with new ones that have sustainability in their core.

4.2.1 The Conventional Model of Business

The current world society is facing global challenges such as poverty, environmental issues, and climate change. The conventional model of business is not intentionally designed to be harmful. There have been no intentions of excluding billions of people from the benefits of globalization, damage to the eco-systems of the earth, or depleting scarce resources. According to Laszlo and Cooperrider (2008) many of these negative impacts from businesses have come from a design model which has been focused narrowly on short term profit and shareholder value. Also, it has been focused on developing technology and products that fulfill a specific target group of customers’ technical demands and design criteria. An example of this design model is the search for product that has right technical and aesthetic performance characteristics necessary to meet the customer needs, while using the cheapest possible raw materials to generate the highest possible profit. According to Laszlo and Cooperrider (2008) the companies treat social, environmental, and economic impacts as externalities that are not of concern if they are not forced to act otherwise by government regulations. They are

therefore treated as risks rather than business opportunity, and are often seen as unavoidable expense for the company.

The companies that do act voluntarily to improve social or environmental issues often do so to get a positive image through work on their Corporate Social Responsibility profile or because the decision makers are feeling responsibility to do the right thing. They do not see it as business opportunities. But, the business models are changing. The global business society is seeing a change in how to view the global challenges. According to an Arthur D. Little report (Published by Emerald (2006)) surveying a group of technology companies, 95% believe that sustainability-driven innovation has the potential to bring new business value. Of the 60% companies that have already embedded it 43% have gained bottom-line results. The companies address sustainability-driven innovation by developing new products and services (72%), process innovation (80%), and entering new markets or developing new business models (60%).

According to Assadourian (2005) stakeholders such as NGO's, local communities, and self-organizing virtual communities have an increased power to influence corporate change. This is done by confronting the companies but also by proactive involvement in their development. They encourage companies to consider not just the next quarter's earnings but also the long-term financial risks of failing to address broader social and environmental issues. The power of the stakeholders is increasingly being recognized by corporate management.

Governmental action has also been taken in order to address the global issues. Legislation in the European Union as well as in California has mandated serious reductions of green house gas emissions by 2020. According to Laszlo and Cooperrider (2008) there is still a large and growing gap between the needs of society and what the public sector can deliver as solutions, since governments and non-governmental organizations are proving ineffective in addressing global problems such as climate change, poverty, pollution, disease, and social exclusion. This means that although governments go into the issues it is not enough and there is still a task for companies to fulfill.

These issues show that there is a great opportunity in rethinking business design in order to address the challenges strategically. A shift in social movement is illustrated in Figure 4.2 (Laszlo and Cooperrider, 2009).

4.2.2 The Appreciative Model of Business

“Imagine a world in which companies offer positive solutions to environmental and social challenges, instead of only reducing their negative impacts.” With this question Laszlo and Cooperrider (2008) illustrate that it is possible to shift the current business world into a perspective where executives investigate the potential business opportunities associated with

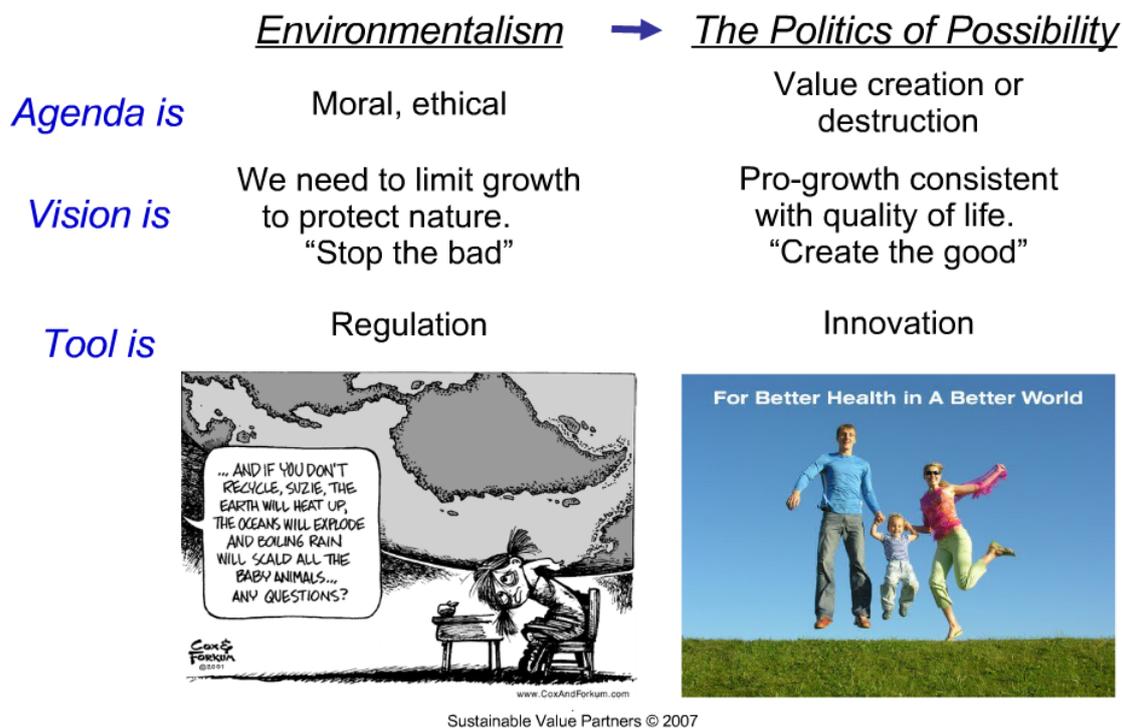


Figure 4.2: Shift in social movement(Laszlo and Cooperrider (2009)).

a good social and environmental performance. Rising social expectations become a way of achieving competitive advantage. In such a business design model the sustainability of the company and its stakeholders become an important issue for the management. This means that decisions have to be taken based on the long-term impact on societal, environmental, and economic issues along the value chain and the stakeholders.

To become a sustainable business it is not only necessary to create value for the shareholders but also for the stakeholders. This means that it should create positive impact on social, environmental, as well as economical aspects. To be able to include the full impact along the value chain this includes taking stakeholders into considerations who might have been considered marginal or adversarial. Laszlo and Cooperrider (2008) stress that it is not possible to please every individual or group; and that trade-offs are an increasing reality in today’s businesses. An illustration of the two-dimensional view of business sustainability is shown in Figure 4.3 taking both shareholders and stakeholders into account.

Examples from the chemical product industry of companies that have been unsustainable in the upper left corner of the model is leaded paint, asbestos, and chlorinated plastics businesses. They were earning shareholder profit while destroying stakeholder value until business risk incurred, and the businesses no longer could survive. An example of a chemical product that positively influence stakeholders as well as shareholders is polylactic acid

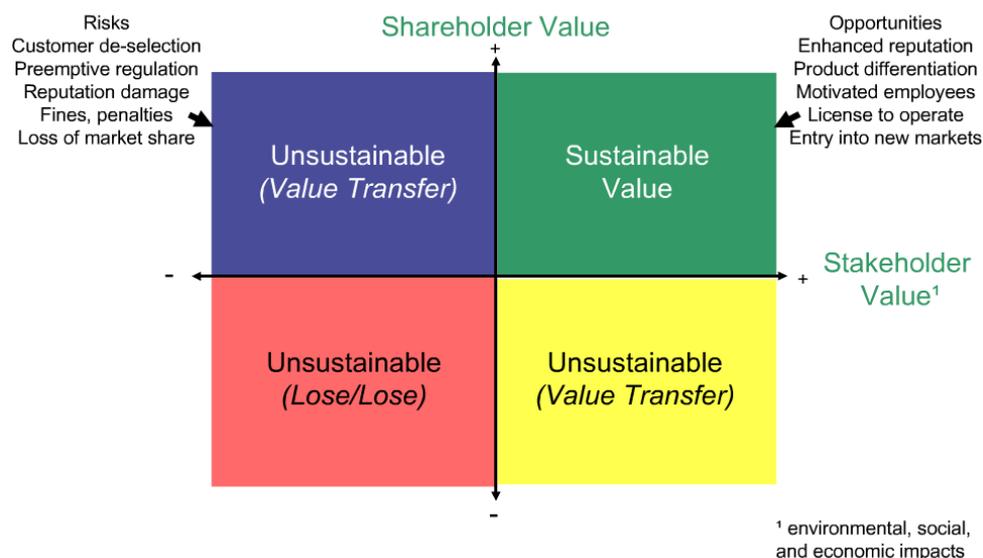


Figure 4.3: Sustainable value requires managing in two dimensions(Laszlo and Cooperrider (2008)).

polymers made from residual starch - that is a business in the upper right corner of the model. This approach can find bottom-line success in the short term as well as in the long run. Laszlo and Cooperrider (2008) describe how Wal-Mart has been successful in selling organic products at mainstream prices and thereby attracting higher-income costumers who might otherwise not shop their stores. They also describe how mainstream companies such as GE, Dupont, Danone, and Toyota by understanding key stakeholders, anticipating changing societal expectations, and using their capacity for innovation are uncovering significant additional business value from superior environmental and social performance.

The social, environmental and economic issues should be addressed in the entire value chain of the organization. An example of a sustainable business design is proposed by Laszlo and Cooperrider (2008) and is shown in Figure 4.4. Translated into chemical product design this means that sustainability should be taken into account in raw materials, suppliers, in all the company operations, the development process, in the production process, in final use of the product, as well as in the recycling or exposure in the end.

The Business as an Agent of World Benefit perspective shows that there is a huge business potential in sustainability. It also shows that stakeholders could be included more in the business design and the product development phases. This could be obtained by involving stakeholders much more in processes such as the Appreciative Inquiry Summit (cf. section 3.3.4) or in Discovery processes during the 4-D Cycle (cf. section 2.3.1). In this perspective Appreciative Inquiry is an ideal method for engaging whole systems rather than small teams, for strategic visioning rather than offer past based strategic goal setting, for creating strategic learning rather than strategic planning, and for aiming for strategic relationships rather than strategic analyses (Laszlo and Cooperrider, 2008). Chemical engineering companies can find

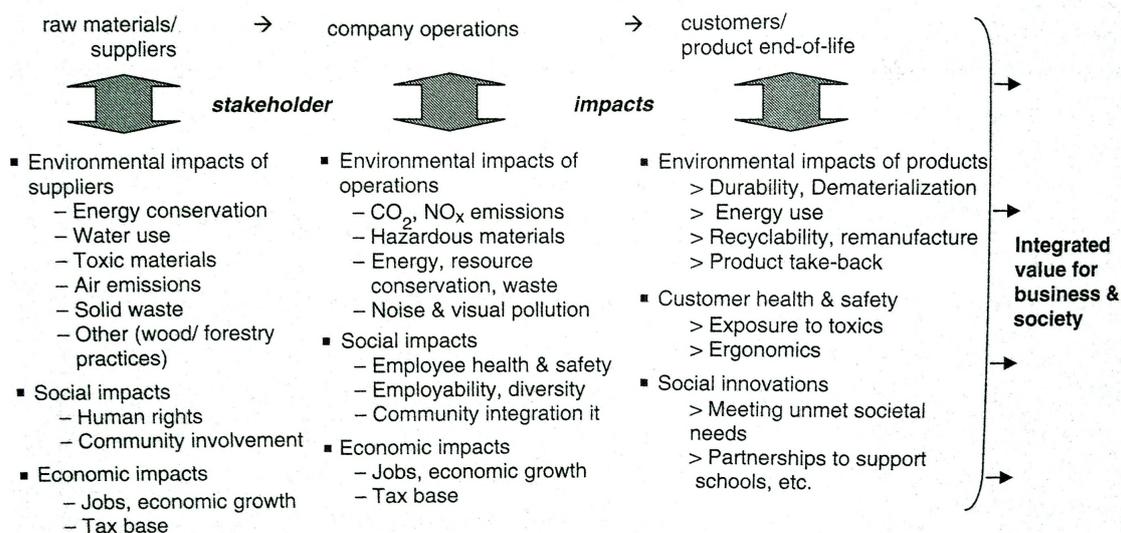


Figure 4.4: Sustainable business design(Laszlo and Cooperrider (2008)).

a large potential in embracing the business opportunities in the Business as an Agent of World Benefit perspective. This is discussed further in the following section.

4.3 Chemical Engineering for World Benefit

Chemical engineering is not just scientific tasks taking place in laboratories. There is a demand for whole systems approaches to development that takes larger perspectives into considerations in terms of sustainability and the inclusion of stakeholders. If the Business as an Agent of World Benefit perspective should be embraced in chemical engineering this would imply an explicit focus on sustainability in its products, processes, and business models. The aim of this section is to discuss what this perspective could imply for chemical engineering.

4.3.1 Green and Sustainable Chemistry

Sustainability is well established in chemical engineering. Anastas and Warner published 12 principles of Green Chemistry in 1998 that should direct chemical engineering into being more sustainable. The principles have a character of guidelines about sustainable methods and thumbs of rule. The twelve principles of Green Chemistry are (Anastas and Warner, 1998):

1. **Prevention** rather than treatment.
2. **Atom Economy** should be maximized by incorporating all materials in the synthesis design.

3. **Less Hazardous Chemical Syntheses** should be practiced whenever possible and thereby generate substances that possess little risk of damage to human health and the environment.
4. **Designing Safer Chemicals** that effect their desired function while minimizing their toxicity.
5. **Safer Solvents and Auxiliaries** should be used and even avoided when possible.
6. **Design for Energy Efficiency.**
7. **Use of Renewable Feedstocks** should be practices rather than depleting resources.
8. **Reduce Derivatives** to minimize the use of additional reagents and creation of waste.
9. **Use Catalysis**, selectively preferred, to substitute stoichiometric reagents.
10. **Design for Degradation** to minimize damage in the degrading form.
11. **Real-Time Analysis for Pollution Prevention** and in-process monitoring can be great analytical tools for maximizing protection.
12. **Inherently Safer Chemistry for Accident Prevention.**

This list gives some useful pointers for chemical product developers in their design of sustainable products and chemical processes. Hansen and Johansen (2007) propose that these principles are not goals in themselves but rather methods of reaching for the purpose of sustainability. Lancaster (2002) introduces 8 factors that chemical engineering should focus on reducing to improve sustainability: Materials, Energy, Waste, Risk/Danger, Cost, Factories, Environmental Impact, and Volatile Organic Compounds. Hansen and Johansen (2007) propose that the decrease of Lancaster's factors can be seen as a purpose for Green and Sustainable Chemistry and that the 12 principles are used as suggested methods. Chemical products and processes can be more sustainable by following these guidelines. As the principle shows, most of the impact is actually in the design phase of the product development rather than in the production phase. This means that chemical product development should incorporate the principles of green chemistry in the design phase.

An example of a sustainable improvement in a chemical reaction is shown in Figure 4.5 that shows the conventional oxidation of a ketone by stoichiometric reagents and how it can be substituted by a catalytic oxidation instead that only yields water as its waste product. This is a huge improvement for the process because not only is less waste created, it is also cheaper, less toxic, more atomic efficient, and more selective. This shows how catalysis is an increasingly important technology in creating sustainable chemical products and processes in the future, e.g. with maturing technologies such as gold catalysis (Marsden et al., 2008).

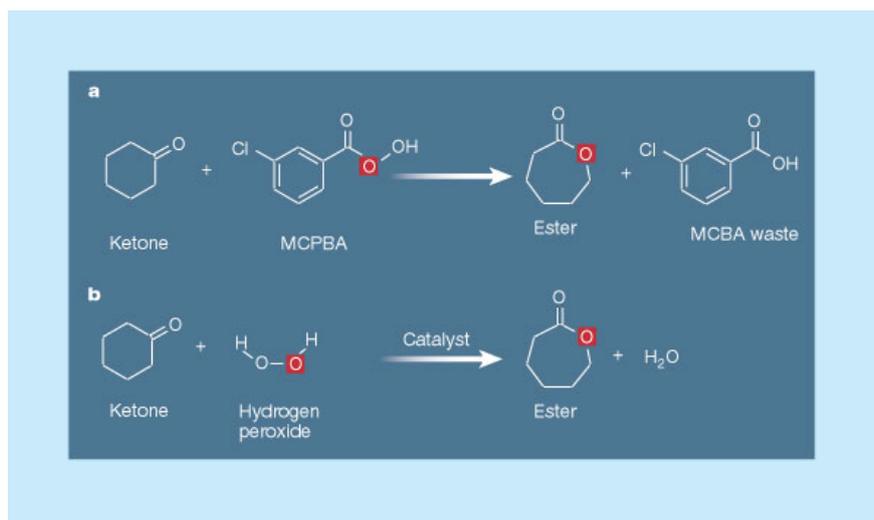


Figure 4.5: Example of a reaction that can become more sustainable by using catalysis (Strukul, 2001).

4.3.2 Sustainability and World Benefit

In what way can green and sustainable chemistry contribute to making chemical engineering an agent of world benefit? World benefit is more than limiting the environmental impact. Sustainability incorporates three dimensions: Environmental, Social, and Economical impact. Chemical engineering for world benefit should therefore definitely focus on minimizing the negative environmental impact of products and processes. But it should do more than this; it should stride to design products and processes with a positive impact on sustainability regarding all three dimensions. This includes a focus on the social aspects of engineering such as how factories can impact communities by offering new partnerships with local suppliers and minimizing the impact of waste streams. Chemical products should seek to create positive differences for social equity.

The economical dimension of sustainability is also important. Since the evolution of the free market economy favors profitable companies and eliminates unprofitable ones, it is important for sustainable companies to be profitable. This means that new technology besides being environmentally and socially beneficial also should be profitable. Appreciative chemical engineering is when all dimensions of sustainability are embraced in order to create positive results for the world.

From this analysis, I would like to bring three approaches forward than can be used in chemical companies to create sustainable world benefit:

Design of New Sustainable Products. The purpose of most product development is to create a better lifestyle and opportunities for human beings. In an appreciative perspective this means to enable humans to get a better life with new possibilities and more happiness. This can be in terms of helping people with their basic needs such as pharmaceuticals,

personal hygiene or clean water, or in terms of elevating human potential by creating superior antifouling paint for tank vessels or advanced materials for the electronics industry. The key for making the products sustainable is to consider and optimize the real value-adding benefits rather than only seeking profit, and it is to consider the possible environmental and social impacts.

The approach can either be a search for better efficiency and redesign of existing concepts in a way that makes them more sustainable, or it can be to innovate new products that fulfill new potentials, e.g. for social benefit.

Optimization of Processes. The Green and Sustainable Chemistry perspective offers many ideas on how to improve chemical processes in a way that minimizes the negative environmental impacts as well as improves the economical perspectives. This is done by redesigning processes in ways that better utilize materials, minimize the need for energy and reagents, and increase efficiency. Catalysis could be a key to many of these improvements. Another approach is to gradually implement renewables in the chemical processes as a means to out phase the need for depleting resources.

Better Integration between Product and Process Design. The final approach is to better integrate product and process design to simultaneously embrace sustainability. Already in the design phase of product development most elements of the chemical process is determined, and often without thorough knowledge about the consequences. The key to attaining sustainable processes is therefore great design during product development, and the key to creating sustainable products is innovative use of the knowledge from chemical process design.

4.4 Summary

In this section the organizational task subsystem has been explored in relation to how Appreciative Inquiry can affect the task of businesses. It was argued that appreciative organizations often change their purpose in order to give it more positive meaning. By having a meaningful purpose organizations have a better position to create partnerships. Appreciative Inquiry embraces external partnerships in its nature and basic methods.

The Business as an Agent of Benefit model adds a new perspective to strategy. It stresses that both shareholders' and stakeholders' needs should be satisfied to create sustainable value. The approach also identifies the large business opportunity that exists in sustainability. Chemical engineering companies have a large potential for embracing these business opportunities.

Sustainability is already in focus within chemical engineering. Green chemistry and sus-

tainable chemistry have principles and suggest methods on how to create more sustainable products and processes. The key to creating more sustainable chemical products is in the borderline between product design and process design.

In this chapter the implications of using the appreciative approach for the purpose of companies has been investigated. In the following chapter the conventional process of chemical product development will be discussed.

5

Technology: Chemical Product Development

The purpose of this chapter is to investigate the conventional process of chemical product development in order to understand how Appreciative Inquiry can be introduced into the development process.

Chemical product design is actually a quite new field in chemical engineering. Until the beginning of the 1990's, chemical engineering has been dominated by its focus on chemical process design. Process design is concerned with optimizing the production process rather than designing what product to produce. This was mainly due to the large importance of bulk chemicals, but also because many markets were created by technology-push. In the middle of the 20th century most markets in the chemical industry were created and driven from the development of new technologies that came merely from science and engineering. Polymers, for instance, were developed without any prior market investigations and the new technology lead to new products that created new markets. When such a new technology was identified the role of chemical engineering was to develop the process in order to lower the manufacturing costs.

The situation has changed significantly since then. Bröckel et al. (2007a) state that most markets in the chemical industry are well established and quite saturated. The consequence of this, they state, is that most innovation instead is moving towards a market-push where

companies are asking costumers about needs and then develop technology to fulfill these needs. The need for this new approach to chemical engineering has lead to the new field of chemical product design. By identifying and understanding costumer needs and using the knowledge of traditional chemical process design, product designers can develop and bring successful products to the market (Cussler and Moggridge, 2001).

In this chapter the conventional process for chemical product development will be investigated. First by presenting the fundamentals of product development and the overall design of the process and then by analyzing the details of the different phases and methods.

5.1 Fundamentals of Chemical Product Development

Chemical product development is a process of designing new products as well as their production process. Chemical process design is a process of designing how products are produced most efficient and effectively.

Traditionally chemists and biologists have identified new active chemicals for some purpose, and the role of chemical engineers has been to do chemical process design in order to make production of the chemicals in large scales possible. With increased complexity in the products, the new role of chemical engineers is product design, i.e. designing how the active chemicals are converted into a useful form and then how they are produced in large scales. They also have to identify new potentials that can be developed for new markets by formulating the active chemicals differently or by combining different active chemicals. The job of chemical product engineers is very broad in the sense that they have to use knowledge from costumers and marketing, the scientist researchers, the production process designers, as well as product design and formulation. A process of chemical product development includes a broad range of different people with different competencies. In general chemical products can be classified into three categories as shown in Figure 5.1 depending on how much they are processed.

The shift from conventional chemical engineering to the new field of chemical product engineering entails that more and more products of the most complex classification are being developed, and this demands more complex development processes. This can be described further with a few examples of chemical products and the role of the chemical product designer:

- Pharmaceuticals: The formulation of active pharmaceutical ingredients into useful forms as well as large scale production.
 - Materials: The design of advanced materials as well as design of processes that can produce them in useful shapes.
-

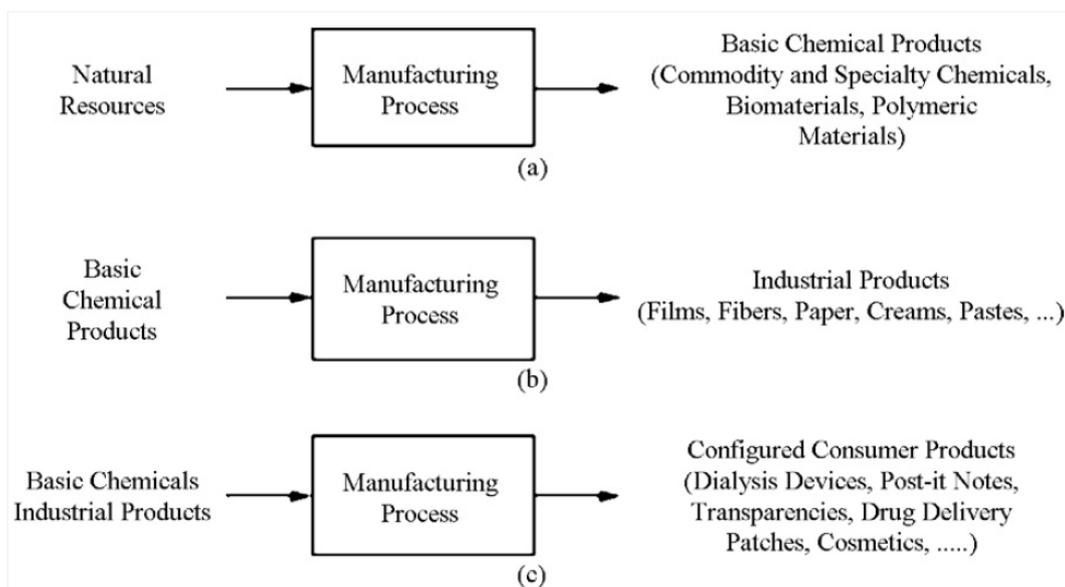


Figure 5.1: Three different classifications of chemical products (Seidera et al., 2009).

- Personal Hygiene Products: The design of products such as toothpaste and shampoo and large scale production.

In the case of pharmaceuticals, it is no longer enough to have the active ingredient produced in large quantities. Most types of medicine also need to be formulated in a way so the product can be stored and so controlled release can happen. In the case of materials it is not enough to invent new materials, they also need to be put together in intelligent designs that utilize their properties and they need to be produced in useful forms. In the case of personal hygiene, it is not enough to create effective toothpaste; it also needs to look like toothpaste. These kinds of tasks are the tasks of the chemical product engineer in collaboration with colleagues. All of these examples share the fact that they are process intensive which means that the product design is closely interrelated with the process design.

In chemical product development there is obviously a need for integration between large numbers of people in a product development project. This shows the need for whole systems approaches and good structures for involvement and integration. There are also a large number of different phases that needs to be connected. New ideas have to be created and preferred options need to be selected. Goltz describes the difference between divergence and convergence in product development, where the former represents a search for alternatives and the latter represents comparison and selection (Goltz, 1986, in Kamata, 2002). Convergent action requires operational efficiency while divergent action requires generative capacity (Avital and Teeni, 2009). This is a useful description for understanding the processes involved in product design, as illustrated in Figure 5.2.

Another issue to introduce is the constraints that limit the design of new products. It is

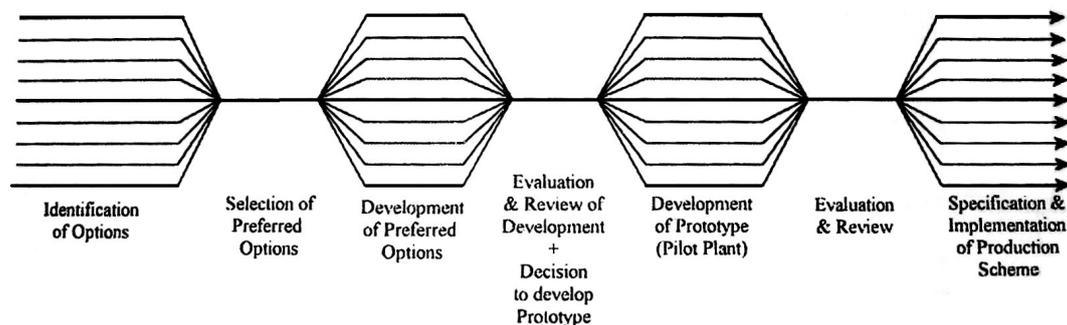


Figure 5.2: Divergent and Convergent character in product development (Goltz, 1986, in Kamata, 2002).

necessary to assess the situation when determining the freedom of operation to make sure it works in correlation with the company strategy and legal matters. Since competitors also behave dynamically, it is necessary during the design process to check for new competitor patents. Likewise, it is necessary to consider the laws and regulatory issues that apply in the market, i.e. in pharmaceuticals or foods industries which have severe regulations regarding ingredients, process design, and quality. Religious or other interest groups might also have their views on certain perspectives and can have a significant influence, just as it might be necessary to consider how the product might influence the company's brand image (Bröckel et al., 2007b).

In the following, the concept of master planning will be introduced and then the conventional processes of chemical product development.

5.1.1 Master Planning

A master plan is a generic plan based on which it is possible to execute a development project within a standardized process. It is a description of the project activities for each involved discipline or project phase. Based on this plan the project can be structured in order to include the right activities and disciplines on the right time (Bröckel et al., 2007b). In other words, it is a description of the development process. A master plan can be designed in various ways with different levels of details. Some are designs of actual processes while others are more a kind of structural process, i.e. when the different phases in the plan are defined by their delivery. In this case the master plan describes the overall structure rather than the actual process. Other master plans describe the process and not so much the structure.

Figures 5.3 and 5.4 illustrate the overall concept of a master plan. The former by specifying the different phases as well as important milestone, and the latter by specifying what the

different departments should do in each phase.

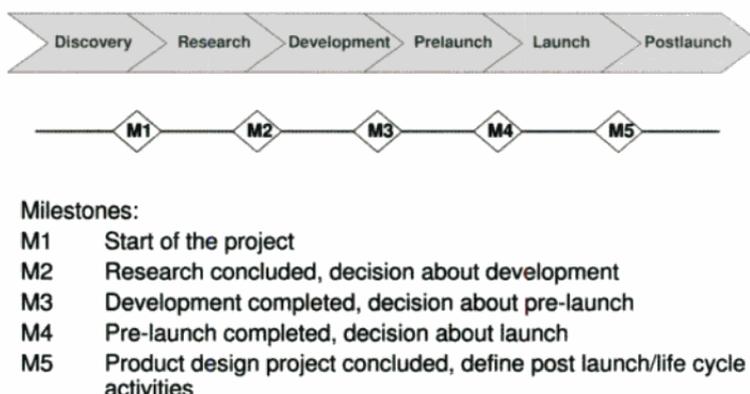


Figure 5.3: Master plan: Illustrations of phases and milestones (Bröckel et al., 2007b).

Function	M1		M2		M3		M4		M5	
	Out	In	Out	In	Out	In	Out	In	Out	
Chemistry	Evaluate synthetic route	Synthetic process selected	Process scale up	Scale up concluded	Transfer know how to production	Know how transfer completed	Start up	Analyze results and evaluate improvement	Improvement and optimization program	
Galenic/ Formulation	Form feasibility	Form prototype	Form process scale up	Scale up and techn. Application concluded	Transfer know how to production and marketing	Know how transfer completed, pilot/ production started	Start up	Assess product form and process	Support production and marketing	
Production	Production cost estimation	Internal production cost validation	Production strategy predefined	Production strategy incl. volumes, site, investment	Plan production (SOPs, supply, packaging, logistics)	Production planning completed	Start launch production (master batches)	Assess critical issues	Define/implement improvement program	
Marketing	Initial product concept	Validate with partner product concept	Initiate marketing strategy and tactics	Finalize marketing strategy	Prepare global and local launch package	Finalize global launch package	Start launch in Areas	Launch	Adjust marketing strategy and product concept	

Figure 5.4: Master plan: Illustration of functions and their tasks in different phases (Bröckel et al., 2007b).

The Stage-Gate model can be used as a master plan which describes the structural process of product development (Rosenau et al., 2005). It specifies what should be created at different stages and where decisions are made. This means that it describes the deliveries after each stage and the decision process before moving to the next stage. An illustration of the Stage-Gate model for product development is shown in Figure 5.5.

Master planning is valuable in product development to integrate the many different types of necessary knowledge. The design of the master plan is an important factor for successful product development, and in the following specific processes for chemical product development will be introduced.

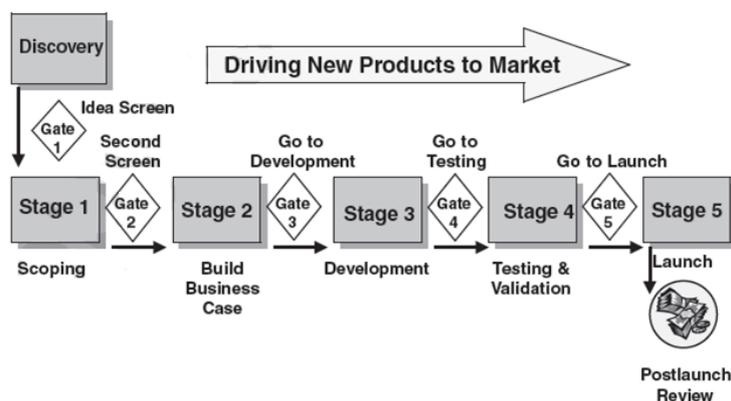


Figure 5.5: Stage Gate model for product development (Rosenau et al., 2005).

5.1.2 Conventional Chemical Product Development

As described in the beginning of this chapter, the field of chemical product design is quite young. In academia the first textbook on how to perform chemical product design was *An Introduction to Chemical Product Design* by Cussler and Moggridge (2001). In their work they present a process for chemical product development and describe how it is different from chemical process design. They propose a procedure consisting of four basic phases:

1. **Needs.** What needs should the product fulfill?
2. **Ideas.** What different products could satisfy these needs?
3. **Selection.** Which ideas are the most promising?
4. **Manufacture.** How can we make the product in commercial quantities?

In the fourth phase the well-developed practices of chemical process design are applied, but it is in the initial three phases that the new field of chemical product engineering is carried out.

Cussler and Moggridge (2001) are inspired by an earlier description of product development that takes its origin in mechanical engineering. In their book Ulrich and Eppinger (2003) propose a general product development process with five phases:

1. **Concept Development**
2. **System-Level Design**
3. **Detail Design**
4. **Testing and Refinement**
5. **Production and Ramp-Up**

System-level design includes product architecture, definition of components or subsystems, and a preliminary flow sheet of production. They note that the development process needs to be adopted to fit with variants of the development process. The generic process is based on a market-pull approach but it can also fit other approaches such as technology-push, development of platform products, process intensive products, or customized products. A technology push approach assumes the use of a specific technology and the platform approach assumes the use of a specific technology platform. The process-intensive approach is relevant for most chemical products as the process must be developed together with the products from an early stage of the development. Customized products are slight variants of existing products and therefore allows for a highly structured development process (Ulrich and Eppinger, 2003).

Wesselingh et al. (2007) build their own process based on the same basic idea that Cussler and Moggridge (2001) use. In their description they go much more into details about methods that can be used during the process. Their model of the following four phases:

1. **Begin.** Team up, get a method, analyze situation.
2. **Design.** Needs, specifications, concepts.
3. **Develop.** Formulate, flow sheet, equipment, scale up.
4. **Exploit.** Organize market, sales, future products.

In the following sections the process of chemical product development will be described along with details about proposed methods. Although the different authors use different descriptions for their respective processes it is basically the same procedure. I will therefore use four phases that correspond to these phases, i.e.:

1. **Project Start-Up**
2. **Concept Generation and Selection**
3. **Product Development**
4. **Production**

I will especially focus on the concept generation and selection phase because I see this phase as particularly interesting for the application of Appreciative Inquiry.

5.2 Process and Methods for Chemical Product Development

In this section the conventional process for chemical product development is described (as described by Ulrich and Eppinger, 2003; Cussler and Moggridge, 2001; Wesselingh et al., 2007). Four phases will be investigated: Project start-up, Concept generation and selection, Product development, and Production and continuation.

5.2.1 Project Start-Up

In the project start-up phase, the organization needs to build a product development team. This includes allocating the right people and selecting an appropriate organizational structure. To do this, an assessment of the skills and competencies needed in the team and an assessment of potential team members and their competencies are necessary.

The next step is to select a master plan that the development process can follow. This includes specifications of decision making procedures in the process, as well as specifying if certain methods should be used in particular stages. Considerations about whether to use a market-pull or technology-push approach are also included in this step.

After this, initial analyses need to be performed such as economical analysis, initial customer analysis, and a market analysis including the presence of patents within the area. There might also be a need for a more thorough analysis of other design considerations including specific limitations due to quality, cultural, religious, or corporate needs. It might also be valuable to perform a more thorough analysis of existing products on the market and within the corporation.

Another important decision to make for many chemical engineering companies is the patenting or secrecy strategy. New inventions can either be published or patented to ensure the rights, but this strategy leads to the diffusion of valuable information to competitors, and it might sometimes be better to use a secrecy strategy, e.g. when new production technology has been invented that is not possible for competitors to investigate from a retrospective product analysis.

5.2.2 Concept Generation and Selection

The concept generation phase is where customer needs are uncovered and new ideas for solutions are generated and selected. Ulrich and Eppinger (2003) expands the concept development phase into a series of activities and calls it the front-end process as shown on Figure 5.6.

This corresponds to the design phase of Wesselingh et al. (2007) and also to the first three phases of the procedure from Cussler and Moggridge (2001): Needs, Ideas, and Selection. Cussler and Moggridge (2001) propose that management decision gates are placed after specifications have been established, after product generation and an initial sorting, and after the final concept selection. The phase will be described in more details in the following.

Customer Needs.

The goal of this step is to understand customer needs and to describe them effectively. A desired output could be a hierarchical list of ranked customer needs with importance factors

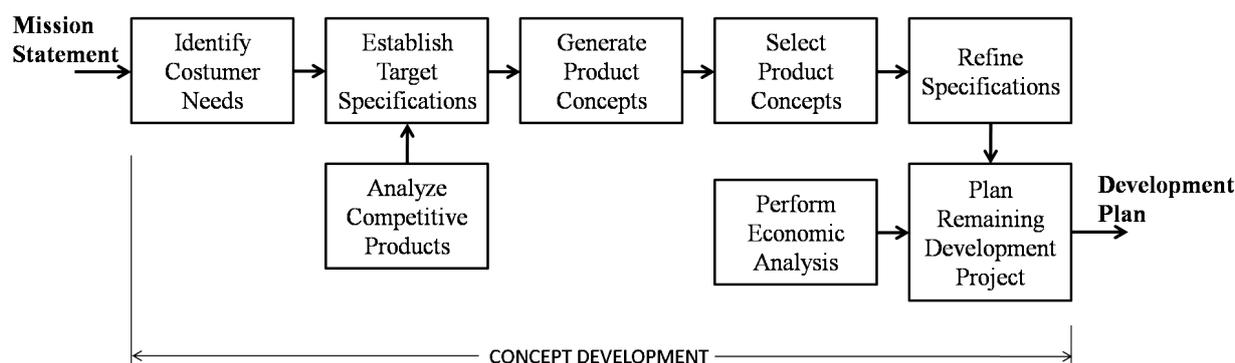


Figure 5.6: Concept Development: The front-end activities (Ulrich and Eppinger, 2003).

for each need (Ulrich and Eppinger, 2003). According to Cussler and Moggridge (2001) the phase of elucidating customer needs involves three sequential steps: First interviewing customers, second interpreting the expressed needs, and third translating these needs into product specifications. This phase is about stating the specific needs and not on meeting them or narrowing the product definition prematurely. The primary source of defining needs is by interviewing different groups of costumers. Cussler and Moggridge (2001) propose doing 10 to 50 face-to-face interviews, and also to use focus groups or trained test panels. Before interviewing takes place, they propose that the product design team members all write out the project scope, the product's target market, and the key business goals. This will help the focus of the interview. They also propose that some questions are prepared in advance, as well as guidelines for the interview. Questions could be: How do you use the existing product? What features work? What features does not work? Interview guidelines could include: Encourage tangents, stimulate with alternatives, remove assumptions, and be alert for surprises.

The next step is to convert the information from the interviews into needs. The interviews are normally full of irrelevant information and redundancy, and the challenge is to organize the relevant information into groups and edit them into a cogent list. While organizing it is possible to drop some needs that obviously does not match the problem space or the capability of the company (Cussler and Moggridge, 2001).

When a list has been created it is desired to rank the needs as essential, desirable, and useful. The final product must meet all the essential needs, and it would be good if it meets the desirable needs, especially if existing competitive products does not meet them. The useful needs are not being explicitly included in the design process although it will be good to meet them. If the goal is to improve an existing product it is often possible for the core team to rank the needs by discussion until consensus, followed by an additional review by costumers. If the goal is to create a new product, it is necessary to return to the costumers to do this (Cussler and Moggridge, 2001).

Wesselingh et al. (2007) proposes to end up with a list of needs grouped into up to 7 super groups, where each need is ranked from 1 to 5, where 5 means essential.

Specifications and Analysis of Competing Products.

The next step is to turn customer needs into specifications that can be quantified. During the interviews qualitative needs will often be discovered, but to design a product the engineer needs to turn this into a quantitative specification to be able to know the success criteria and design parameters. Although the qualitative need might be known, i.e. as a softer feeling, a crunchier cereal, a smoother skin, etc. the question for the designer is how much improvement will be necessary and valued. This is why specifications are necessary.

Each need should be turned into at least one specification. Each specification consists of a metric and a numerical value. A metric is a quantifiable property of the product. Ideally, there is one metric for each specification but sometimes there is a need for more than one metric to describe a specification and sometimes a metric influences more than one specification.

Sometimes it is trivial to find a metric that is easily measured and described. Other specifications are complex to describe and quantify, making the identification of metrics hard. When specifications relate to consumer products, they can often be investigated and correlated empirically with something else that can be quantified. For example, some specific taste of chocolate can be correlated with the crystal size created during cooling, and this knowledge can be used to describe the specifications that the chocolate needs. Sometimes it might be necessary to quantify a metric by using a subjective test panel. This is for example useful for taste and smell, allowing for a quantification, although often expensive, time-consuming, and including some uncertainty. Sometimes there is an industry standard for a specification that might be used.

After turning every need into specifications with at least one metric per specification it is necessary to investigate what the desired value for each specification should be. This often requires some basic chemical engineering analysis and calculations and often also some analysis of competitive products.

Cussler and Moggridge (2001) suggests a strategy for getting started on the specifications:

1. Write complete chemical reactions for any chemical steps included.
2. Make mass and energy balances important in product use.
3. Estimate any important rates that occur during product use.

They stress that considerations of mass versus moles can be critical and that checking stoichiometry is important to do in the beginning. Another advise is to use all reasonable simplifications to get a faster solution. This includes assuming physical properties to be con-

Table 5.1: List of Specifications (Wesselingh et al., 2007).

Specification	Rank	Unit	Marginal Value	Ideal Value
Aroma	5	Subj.	••	•••
Yield stress	5	Pa	50 .. 200	120 .. 140
Viscosity	4	Pa·s	5 .. 15	6 .. 10
Price	5	\$	< 1.40	< 1.20

stant such as densities and heat capacities for the thermodynamical estimations, Newtonian behavior, and constant transport coefficients for the rate estimations.

After having the chemical reactions defined, the relevant balances set up, and the rates defined, it is easier to set up specifications. This will allow for justified specifications that will fulfill the needs.

A key to successful positioning of a new market can come from analysis of competitive products. This can be a rich source of new ideas for the product as well as the production process design (Ulrich and Eppinger, 2003). Benchmarking can be used for testing the specifications and to develop marginal and ideal values for each metric. A competitive benchmarking chart based on the metrics can be used to organize the information and to develop the target values for the product. Also, information about competitive products and benchmarking is useful when selecting concepts at a later stage.

It is a good idea to revise the specifications once the list is done to make sure that they seem reasonable. Sometimes specifications are too unrealistic as they demand too expensive materials, impossible technology, too high concentrations, etc. Likewise, the revised list of specifications should take into account the knowledge from competing products. The revision is sometimes called a back-of-the-envelope-calculation or a chicken-test from the Canadian Government's test of jet turbines by throwing frozen chickens into the running turbine (Cussler and Moggridge, 2001).

Wesselingh et al. (2007) proposes that the output of this step is list of specifications with marginal and ideal values as shown in Table 5.1. It is a good idea to check that the specifications cover all the needs.

Cussler and Moggridge (2001) proposes that a decision gate concludes the initial steps of identifying needs and turning them into specifications.

Concept Generation

The concept generation activity is a diverging step where the quantity of new ideas ideally is very high. Many idea generation techniques exist that I will not go into details about. The term idea will be used here as a precursor for concept, i.e. something not completely worked out. Wesselingh et al. (2007) propose to do concept generation from the list of specifications

by following five steps:

1. splitting into smaller problems (decomposing)
2. searching for existing ideas or concepts
3. searching for new ideas or concepts
4. exploring combinations of these concepts
5. looking back and repeat steps

By using these five steps a more systematic approach can be used to concept generation. Known methods such as brainstorming, mind mapping, etc. can be applied within the steps.

Concept Selection

At this point a large number of ideas and concepts have been generated. The goal of this step is to select zero to three (ideally just one) concepts that can continue to the production phase. Cussler and Moggridge (2001) suggests that this could be done through two steps; screening and selection, with a decision gate after each of them. Since a large number of ideas are usually considered it is not possible to make the necessary quantitative calculations to select between them all and a rough screening might be beneficial instead. At the same time this leaves some room for considering properties that are not easily calculated.

A strategy for idea screening is to choose the most important factors for the product and then compare the different ideas to each other by a rough estimation of how well each idea satisfies the factor. Factors should generally include the following(Cussler and Moggridge, 2001):

1. Scientific maturity
2. Engineering ease
3. Minimum risk
4. Low cost
5. Safety
6. Low environmental impact
7. Other factors

It is then proposed to use a Concept-Screening matrix to evaluate the different concepts. This will make it possible to consider a large amount of concepts at the same time with a numerical method and can be done in a spreadsheet. The factors for evaluation are used as selection criteria and each is assigned a weighing factor. It is recommended to also compare with a Benchmark which could be the leading competing product. Each concept should then be assigned a score for each selection criteria from -5 to +5 compared to the Benchmark. An example of a Concept-Screening matrix for three concepts is shown in Table 5.2. As the

Table 5.2: Concept-Screening Matrix.

Selection Criteria	Weight Factor	Benchmark	Concept1	Concept2	Concept3
Scientific Maturity	0.2	0	-2	2	1
Engineering Ease	0.3	0	2	4	1
Low Cost	0.1	0	0	-1	1
Environmental Impact	0.4	0	-1	-1	5
Total Score		0	-0.2	1.1	2.6

table shows concept 1 is worse than the Benchmark while concept 3 has the higher score and should continue through the screening step. Normally, around five of the best concepts are chosen in the screening step.

This method is good for handling a large number of ideas that can be easily compared. It is obviously only a helpful tool and not a universal answer to the screening step. Also, the matrix should be tested for its sensitivity to the different factors by changing numbers slightly and see if the ranking changes significantly and using another Benchmark might also be a good idea to check the results. Then, a step of combining and improving the concepts is suggested by Ulrich and Eppinger (2003).

After finding the best ca. five concepts Cussler and Moggridge (2001) suggests to have a decision gate that concludes the concept generation, sorting and screening steps. This gate is important as it is the foundation for making a successful product and because it might be hard to make an objective decision for management if charmed by suggested innovations and excited by product improvements that might be unrealistic. Therefore the development team should help to make an objective decision.

The next step is selection of the best concept for production. This requires the use of chemistry and engineering criteria. Some concepts can be compared using only technical criteria and calculations while others also needs to take less exact criteria into considerations.

Without going into details, products can be compared using thermodynamics where chemical equilibria and heats of reaction could be of importance. Kinetics could also be important as well as chemical reaction rates might be relevant. Transport phenomena might also be useful to include such as momentum, heat, and mass transfer. By setting up mathematical models it is often possible to compare different concepts using these technical criteria and then select what concept is best suited for fulfilling the customer needs. Also, computational methods such as simulations can be very useful. According to Cussler and Moggridge (2001) this approach of using technical input is the most important difference between chemical product design and other methods of inventing new consumer products.

Another perspective is important to take into considerations as well. While chemistry and engineering will allow the estimation of the performance of, as an example, a catalyst and

also the cost, they will not help in balancing these two criteria. Also, criteria such as what people like the most and the effect on CSR are not easily accounted for with technical calculations.

A useful approach here is to make another decision matrix with weighted criteria. This Selection-Matrix differs from the screening matrix in the level of details that are used. While the screening matrix was used to screen around 20 concepts and find the promising, the selection matrix only considers promising ideas and the amount of criteria needs to be higher and more importantly the weighing factors and the scores need to be determined with as much accuracy as possible.

It should be noted that different market segments might value the concepts differently. In this case it is probably not a good choice to take the average but instead it will be necessary to make a choice of which segment to satisfy.

The use of subjective judgments is usually not preferred by engineers. Therefore subjective choices are often postponed as much as possible. It is easier to dismiss a concept because it is not economically feasible rather than to decide whether costumers will like it. Already at the point where evaluation criteria have to be chosen a subjective choice is to be made. A few pointers for choosing good criteria are given by Cussler and Moggridge (2001): Use independent criteria, to ensure that the same property is not covered by different criteria. Also, avoid repetition so scores are not artificially raised due to measuring the same thing twice but in different ways. Finally, use a complete list of criteria to ensure that nothing critical is left out. It is necessary to put effort into getting as much information from market research as possible into the choice of criteria and weighings.

The use of the Selection-Matrix gives some advantages in the decision making. It makes the decision explicit and systematic, and the costumers are in focus. It also takes competing products into account. As it can take the process into account this method enhances product-process coordination. Also, the demand for criteria and weighing forces the team to effectively search for external input and to use all the resources on the team; leading to effective group decision making. Documentation of the decision process is also possible. Finally, the separate scoring of different criteria makes the strengths and weaknesses of each product obvious and enables enhancement of the concepts by the option of combining concepts (Ulrich and Eppinger, 2003; Cussler and Moggridge, 2001).

Other selection methods include (Ulrich and Eppinger, 2003):

1. **External Decision.** Costumer, client, or other external source.
 2. **Product Champion.** An influential team member chooses.
 3. **Intuition.** The product with the best “feel”. No criteria are used.
 4. **Pros and Cons.** A list of strengths and weaknesses are used.
-

5. **Prototype and Test.** Test data from prototypes is used.

The decision matrices are preferred by Cussler and Moggridge (2001) and Wesselingh et al. (2007), and they can be backed up by the use of mathematical models or experiments.

The selection step aims at choosing the best one or two concepts for production and should end by a decision gate. This gate is critical as the next phase requires large amounts of money.

Refinement of Specifications

When a concept has been selected it is necessary to refine the specifications to prepare for the subsequent development phase. This task is difficult since choice of trade-offs between different specifications should be resolved. Trade-offs can occur between different technical performance metrics, i.e. weight and strength and almost always between performance and cost. The refinements of specifications can be supported by developing a rapid prototype of the product to use for discussions, including necessary mathematical models or experiments. A technical model and a cost model might also be very beneficial.

Project Planning and Economic Analysis

This is the feasibility analysis stage where economics and time perspectives get introduced. This includes risk analyses and economical analyses. The main objective of this step is to validate the superiority of the selected concepts against the costumers' requirements, and to build a business case for the project. This is also a good place for updating market assessments, competitive analyses, and reexamination of health, safety, and environmental concerns (Seidera et al., 2009). This might also be a good place for creating product prototypes and get them evaluated by costumers. This step concludes the concept generation and selection phase and often ends with a decision gate where it is decided whether to further invest in the project.

5.2.3 Product Development

The next phase is the product development phase where the selected concept needs to be made ready for production. This includes formulation of the product into a useful form as well as setting up the process for production.

Formulation is one of the core chemical engineering tasks of the chemical product engineer where the interrelated knowledge about product design and process design needs to go together in order to synthesize a great design that is effective in application as well as efficient in production.

The initial formulation step can be enhanced by using some simplified mathematical models to characterize and determine the formulation needs.

Flow sheeting is the next step where the process design is beginning to take form. The initial flow sheeting needs to take the materials into account, the unit operations, the energy requirements, as well as the waste streams. The flow sheeting process is often an iterative process that needs both a good deal of mathematical modeling and experimentation to become successful.

An important input for creating a good process design is to include cost considerations in the flow sheet. This also makes it possible to quantify decisions and trade offs such as high investment cost versus high operation costs (fixed costs versus variable costs).

The flow sheeting step also needs to take equipment choices into considerations. This can be important both in terms of investment choices and simple considerations about the space requirements.

A challenge that always needs to be handled in the flow sheeting is the scale up problematics. This is something that chemical engineers traditionally have a very well developed expertise in doing. Though, it is important to think about the consequences for the product design when up-scaling has an influence on the final product result.

It should be noted here that many of the choices in the process design can lead to a huge impact in terms of the product design. This is why the product design and the process design needs to be integratively carried out.

5.2.4 Production

The production phase is where the implementation happens. This is a traditional chemical engineering task of plant construction, process operation, process optimization, and manufacturing of the product, etc. and will not be described further in this section. It should be noted, however, that this phase also is where market penetration happens and business competencies are used. This includes marketing, launch of the product, and optimization of the product to meet final customer specifications. Continuous market analysis is therefore needed. In this phase it is important to continue to look ahead and ensure the product is continuously updated.

5.3 Summary

In this chapter the field of chemical product development has been introduced. It is a new field in chemical engineering which focuses on creating new chemical products instead of focusing on creating new chemical processes for the production. This shift in focus for chemical engineers means that new working processes and methods need to be introduced.

It has led to the development of a method for chemical product development that has been termed the conventional process in this report. The conventional process can be divided into four phases: The start-up phase, Concept generation and selection, Product development, and Production.

The start-up phase is concerned with creating the conditions for development such as finding the right people, selecting a process, and defining the boundaries for the product design including regulatory issues.

The concept generation and selection phase is concerned with identifying customer needs and generating ideas to solve the needs. The ideas are then turned into concepts which are analyzed, and the best one or more are selected for further work.

The product development phase is concerned with turning the selected concept into a useful formulation and with creating a flow sheet for the production. Here, much of the traditional chemical engineering process design can be applied such as mathematical modeling of different formulations and process designs.

The production phase is concerned with the manufacturing of the product. This includes scaling up the flow sheet and establishing a production plant.

The aim of this chapter has been to explore the current process to be able to identify the potential for using Appreciative Inquiry. The following chapter will build further on this and apply the principles of Appreciative Inquiry on chemical product development.

Appreciative Product Development

In the previous four chapters the four organizational subsystems; people, structure, task, and technology, have been explored in order to understand how Appreciative Inquiry can be used in chemical engineering. It has been shown that the appreciative approach can have a large potential for organizations. Appreciative Inquiry invites itself to be used as a change management process but also as a leadership philosophy. This has led to the development of a whole vocabulary of appreciative terms and methods that can be used to design appreciative organizations and processes. It also invites for rethinking the task of businesses to embrace sustainability.

The conventional process of chemical product development has also been presented. Cho (2008) describes how the field of product design in general during the past decades has shifted from a producer-centered design paradigm to a customer-centered design paradigm. The shift has been powered by the digital revolution changing the possibilities for communication. The new paradigm is characterized by usability recognized by the customer rather than functionality. Because the field of chemical product development is young, this new paradigm has not yet been introduced to the chemical industry. The appreciative approach might embrace this trend in enhancing the field of chemical product development. The exploration of the first three subsystems has showed a large potential in applying the appreciative approach. The aim of this chapter is therefore to suggest how Appreciative Inquiry can be used in chemical product development. This will be done in two steps: First, by introducing Appreciative Inquiry methods into the conventional process of chemical prod-

uct development, and second by designing a new appreciative process for chemical product development.

6.1 Appreciative Methods in Conventional Chemical Product Development

The first step of applying Appreciative Inquiry to chemical product development is to introduce basic appreciative methods into the existing process of chemical product development. This is done by following the same phases as used in section 5.2 for the conventional process: 1) Start-Up, 2) Concept Generation and Selection, 3) Product Development, and 4) Production. Again the main focus will be on the second step.

Before going into the four phases, an introduction to the general implications of applying an appreciative attitude in chemical product development will be presented.

6.1.1 The Appreciative Attitude in Engineering

The appreciative approach can be introduced to organizations in different ways. It does not have to be a traditional top-down decision in the organization. Systematic use of the original Appreciative Inquiry methodology can be done in small scale as well as large scale. The appreciative approach can also be introduced to the organization by being used as philosophy by any one department, team, or individual. When some are using the assumptions and principles of Appreciative Inquiry there is a chance that others will follow and want to learn to do the same.

This is the mindset behind introducing the appreciative attitude into the conventional method of chemical engineering. By introducing the methods systematically, the organization will evolve into more appreciative over time. The appreciative attitude can be valuable to organizations in different ways. Some of the most important principles are:

- **An appreciative and inquiring mindset** about others' actions leads to exploring their intentions and thoughts with questions rather than dismissing them as worthless.
 - **Value-based thinking** instead of deficit-based thinking enables people to seek the best in themselves and others.
 - **Positive design approach** rather than a problem-solving approach encourages the best solutions rather than just fixing the problems.
 - **A positive attitude** in leadership that focuses on creating a positive climate, positive relationships, and flow in the work, seeks positive deviance and extraordinary results.
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- **Open and involving processes** where as many people as possible are involved in change and innovation can yield new results in engineering.
- **Positive meaning** and purpose give people a direction to go for and can lead to new external partnerships.
- **The heliocentric focus** on what gives life and energy to people can be useful in creating great results.
- **Creation of generativity** in the processes is the starting point of transformational change.

There is no doubt that the appreciative approaches offer radically new ways of doing things. The challenge for the appreciative engineer is to combine the best of appreciation with the best of engineering. This includes a good balance between analytical thinking and creative thinking, between the decision attitude and the design attitude, between involving people and using intense small teams, and between creative dreaming and sound engineering.

Many of the appreciative perspectives can be directly applied within the existing discourses of engineering while others need some more preparation to be introduced. To illustrate some of the perspectives in using the appreciative attitude in engineering, two narratives will be told:

The Young Engineer with an Idea

It is weekend and the weather is beautiful for the young chemical engineer who is working for a large Danish pharmaceuticals company. He had been fishing and realized a great new idea about how he could optimize the downstream process of one of the new active pharmaceutical ingredients. He was really looking forward to getting to work and discussing it with his coworkers on Monday. The day arrived fast and at lunch, he eagerly presented the idea to the table of experienced R&D engineers. He described his idea about using some other unit operations and another substance to isolate the product. But, to his surprise the others were obviously not very interested in the idea. "It is against thermodynamics!" one of them said, another added "it would create too much waste product." Realizing his idea was dismissed he returned to his job and did not bring new ideas to the Monday lunch table.

The story is simple, yet it has an important point. The traditional problem-solving approach that seeks to falsify suggestions in order to test their validity is good for solving many engineering tasks but it can also disable development when used in the wrong situations. The premature idea was not yet ready for falsification because it was not fully developed. A quotation by VanGundy (1992) illustrates the point: "*Throwing away ideas too soon is like opening a package of flower seeds and then throwing them away because they're not pretty.*" Instead, the idea should have been developed first just like the flower seed. An appreciative

mindset in this situation would have invited the idea in for a dialogue about its potential before investigating its validity. This situation ended up both with dismissing a potentially good idea but also by reinforcing the young engineer in not bringing new ideas to the table. A well developed appreciative mindset in the organization could have changed the situation into a generative event of innovation instead of a bad experience.

Selection of the Best Idea

A group of three young engineers have been brainstorming about concepts to a new product for the cosmetics industry. The brainstorming created five really good concepts that they were all satisfied with. The marketing department had announced that they could only investigate one concept so the engineers had to choose one based on their judgment. They started seeking for arguments to dismiss some of the concepts in order to bring down the amount of choices. After a while they were down to two ideas because they found some problems with three of the ideas. Another problem arose; two of the people had each found a favorite among the last two concepts. They started shooting at the other idea and defending their own until their frustrations overwhelmed them. After a break they had no energy to go back and continue the fight, and asked the third person to take a pick and get it done. They ended up with a concept that seemed dejected already and no excitement to continue the work later on.

This narrative touches another point connected to the problem solving approach. The engineers started with ideas, they all wanted to work on but ended up spending their time on searching for mistakes to dismiss ideas rather than discussing the potential in them. This led to both dismissing good ideas prematurely and to a loss of energy to the subsequent work. A appreciative method for selection might have been enough to avoid these unfortunate issues.

These two narratives illustrate that there is potential in using the appreciative approaches actively in chemical product engineering. They also show that it can be introduced at different layers; both at the leadership and mindset level but also as specific methods that can elevate the way chemical engineers work. In the following, suggestions for methods to use during the different phases of product development will be given.

6.1.2 The Start-Up Phase

There are many opportunities in the start-up phase to use Appreciative Inquiry. In particular, there is a huge potential in using the approach from the Discovery phase to identify the positive core, reinforce strengths in the team, and realize what competencies that already exist and could be connected. There is also an opportunity for designing a new social architecture or an appreciative organizational structure that supports the team in reaching its goals. In the following some examples of ways Appreciative Inquiry can be applied in the

start-up phase are presented.

Introduction to Appreciative Thinking. If people have not used the appreciative approach before, it can be an idea to introduce the basics. This aims at influencing people to use the appreciative attitude in their daily work. This includes embracing the opportunities described in the previous section. Methods of doing this can range from giving a traditional inspiring lecture or involving people in exercises that exemplify the thoughts, to just using the attitude and talking about it. Most of the exercises presented in this chapter can be used to exemplify Appreciative Inquiry and its related approaches. Two very basic exercises that both can be used as energizers in a break and to illustrate appreciative and systemic points are:

- *Guess a Direction* is a simple exercise where people are instructed to close their eyes, turn around, and then point towards north. When people open up their eyes again, they usually see people pointing in every direction. The facilitator can use this to point out the different views even simple instructions can lead to.
- *Systemic Intro* is an energizing exercise where people are instructed to sustain the same distance to a person they choose. This simple instruction turns into a chaotic exercise, when people need to move between each other to keep the distance, and everybody starts to move because of their interdependencies. This exercise leaves plenty of opportunities to talk about systemic thoughts (Bjerring and Lindén, 2009).

Discovery of Strengths in the Team. The purpose of discovering strengths in the team is to bring forth valuable knowledge about the team's positive core. This includes identifying key potentials and competencies in the team, building good working relations between the team members, and enabling generativity by giving space for generative questions and energizing activities. Confer to the discussion in section 2.3.2 about pre-identity groups and generativity for more information. Methods to do this includes:

- *Appreciative Interviews* in pairs to uncover strengths, potentials, and competencies (Cooperrider et al., 2008c).
 - *Ability Spotting* where competencies are identified among people and labeled (Bjerring and Lindén, 2009).
 - *Short Meetings* where people use prefabricated questions to share successful stories and meet everyone else (Bjerring and Lindén, 2009).
 - *Competency Marketplace* where people identify their key competencies in relation to the task as well as their wishes for personal development. Others then point out the most important competencies for the task and touch upon how to help realize their wishes (Bjerring and Lindén, 2009).
-

- *Missing Person* that helps working groups identify their ideal for a new person in the group who can help them realize how they should develop themselves or where they could get valuable inputs from external partners (Bjerring and Lindén, 2009).
- *Opportunity Mapping* is a method to map and initiate storytelling and knowledge sharing about success. The set up enables people to move around and share their stories of success in different categories. This can lead to both identification of strengths and sharing of opportunities and to creating a useful network among future colleagues.

Appreciativization of the Organization. The purpose is to introduce the appreciative principles of organizing presented in section 3.2.1. These principles could be used as inspiration to re-designing elements in the organizational structure or processes. The start-up phase is where the structure and processes are built, so it is a good time to introduce appreciative design elements. Methods for doing this usually involve dialogue and open processes such as:

- *Café Dialogue* where people are placed at different tables to discuss different predetermined subjects, such as what relational processes or communication could enhance their effectiveness in doing their tasks. In turns people move tables to discuss different topics (Bjerring and Lindén, 2009).
- *Selecting High-Impact Organizational Design Elements* by first creating a Design Possibilities Map and then selecting the most relevant design elements. The chosen elements are turned into provocative propositions in smaller groups (Ludema et al., 2003).
- *Open Space* is a powerful method for creating action inspired by the life in breaks. The method creates small spaces where people choose their own themes and partners for dialogue. In Open Space people are invited to declare subjects they want to talk about, and then people use the law of the two feet to go to the subjects they want to discuss and move on again when they feel they have contributed with what they could (Owen, 2008).

Positive and Appreciative Leadership In the start-up phase, it is also possible to create guidelines and norms for the leadership style. As described in section 2.1.3 positive leadership aims at creating extraordinary results by creating a positive climate, positive relationships, positive communication, and positive meaning. Appreciative leadership is concerned with exploring and appreciating opportunities and people. These approaches to the start-up phase might be useful in creating the best conditions for great results. A useful method for strategic inquiry is:

- *SOAR Model* is the appreciative analogue to the SWOT model. It has two dimensions: Strategic inquiry and appreciative intent. The two facets of the former are: Strengths (what are our greatest assets?) and Opportunities (what are the best possible market
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opportunities?), and the two facets of latter are: Aspirations (what is our preferred future?) and Results (what are the measurable results?). (Stavros et al., 2003).

6.1.3 Concept Generation and Selection

Recall from section 5.2.2 that the concept generation phase is about identifying customer needs, turning them into specifications, finding ideas to fulfill the needs and turning them into concepts that fulfill the specifications, and finally to select the most promising concept. To carry out this process a lot of different methods are required. Some should be creative and divergent and others should be convergent and use technical engineering to assess the choices. The appreciative approach offers some useful tools for the different parts in this phase. One of them is to keep the positive core in mind; it being the strengths of the people and the organization or the strengths of the previous version of the product.

It would be obvious to initiate a full 4-D Cycle to generate and select concepts. The 4-D process leads through both diverging and converging steps that could be used to both generate and select concepts. It would have the advantage that it uses a Discovery phase to initiate energy, knowledge sharing, and generativity. It would especially be useful to include a Discovery phase and a Dream phase in the concept generation and selection phase. Other useful methods include:

Generative Identification of Needs. The first outcome during the conventional process is a collection of customer needs. This is usually carried out by interviews based on a linear thinking (cf. section 3.3.2). Based on a positive design attitude the aim of identifying needs is actually not to get an objective list of what the customer wants, but rather to get input to what a better product should be like. This means that the aim is generativity rather than objectivity, and therefore generative questions should be used instead (cf. section 2.3.2) as well as circular questions (cf. section 3.3.2). The frame could also be different than a traditional interview and involve more stakeholders. The following methods could be used to identify needs based on an appreciative and generative approach:

- *The circular questions* framework presented in section 3.3.2 might be useful in uncovering new knowledge when identifying needs. By using all four question types the expanding and generating capacity should increase before uncovering the influencing intent.
 - *Appreciative Interviews* could be used to uncover strengths and potentials in existing products as well as to start a generative dialogue about wants in future products (Cooperrider et al., 2008c).
 - *Generative questions* could be used actively to create conditions for new ideas and collaboration (Bushe, 2010).
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- *The positive design approach* could be used actively when creating a method of identifying needs and turning them into specifications. This would imply a search for the best solution within a field rather than to solve the current problem.
- *Involving processes* might be a very useful way of generating new knowledge from potential customers as well as ideas for solutions. By embracing the possibilities that a broad group of stakeholders represent, this might lead to valuable knowledge. This approach could include the use of just in time structures (cf. section 3.2.1) such as online fora, social media, open source platforms, etc.

To amplify how generative identification of needs can be useful, an example can be given of using circular questions:

A young product engineer was working for a pharmaceutical company. She had been allocated to the task of identifying needs for a future product by interviewing different permanent users of bandages. The company has started a project on more durable bandages, and the young engineer was beginning an interview session. First she asked clarifying questions about how the customer would use the bandages: How long time do the existing products last? And are they durable enough for your use? If the engineer had used the linear question approach she would have continued with questions asking the customer to describe his needs, and preferably in numbers, such as; how long time do you need your bandages to last? And how durable do they need to be? But instead, the young engineer started to use circular questions. The next question type was expanding question where she asked: What do other people think about your long term bandage? And what other issues than durability might be relevant for you? During these questions she realized the actual problem; it was not that the bandages broke too fast, but that they started smelling which annoyed other people, and it hurt when they had to be changed, so that was why the customers wanted to have them on longer. The next question type was generating questions where she asked: How would a hypothetically perfect bandage work? Finally she turned to the strategic questions realizing that the key design challenge was actually to create bandages that either did not hurt to change or were not smelling but long lasting. Her questions sounded: Would you prefer a long lasting bandage that does not smell or a bandage that does not hurt to change?

This story illustrates some of the possibilities that exist in using circular questions but also in using a positive design approach seeking the best solution rather than fixing the problem. In this case the quick and efficient answer would have fixed the wrong problem. By involving the customer even more in the subsequent phases of the development useful information might become available.

Dream about Innovative Products. By embracing customers and other stakeholders as

partners in the concept development phase new possibilities are created for their involvement. After appreciative interviewing with costumers and stakeholders, they might as well be involved in generating new ideas and dreams about future products. After uncovering the needs it could therefore be beneficial to get them involved in generative conversations (cf. section 2.3.2). This would lead to positive dialogue about what should be designed and also with input on how trade-offs should be made. Methods to use for involving stakeholders in visioning future products could include:

- *Appreciative Inquiry dream questions* offer a good way of creating generative conversations that can uncover valuable information (Cooperrider et al., 2008d).
- *Creative dreaming* (as described in Ludema et al. (2003)) could also be used to envision new products. Rapid prototyping (Kelley, 2001) might be a useful supplement in creative dreaming.
- *The five constraints* is another useful method for enabling creativity and new ways of thinking. The method is basically about identifying the five most used words for the product and then banning them from the subsequent dialogue. This leads to new ways of thinking which are not as limited by the current discourses (Bjerring and Lindén, 2009).

Appreciative Selection. When the divergent phase has created a large number of possibilities and options to choose between, it is time to move into a convergent phase and select what to continue working on. This should be the most promising concept compared with what the scope has defined but it is rarely easy to identify what is most promising and includes subjective choices as well as much guesswork. Most engineers do not like to make subjective choices and they therefore try to turn the choice into something quantifiable. The approach suggested in chapter 5 is to start election by eliminating as many ideas by sound engineering arguments and then quantify the potential of the rest in a matrix and finally make a decision based on this. It is valuable to use explicit ways of discussing and making choices, and the matrix makes quantification very explicit. But, the underlying problem solving approach might not yield the best results, although it may be the fastest and easiest way to select. The underlying assumption behind this approach is that one concept is better than the others and the way to find it is to eliminate the others. The theory in this report states that a better underlying assumption would be that each concept has a potential which has not yet been fully developed, and that selection should uncover the untapped potential of this idea. There is a better potential in searching for the biggest aptitude in a concept instead of looking for the survivor after eliminating as many concepts as possible. This approach is based on the design with a positive lens approach described in section 3.1.2. The methods that can be used for appreciative selection include the following:

- *The Possible/Desirable chart* is a coordination system with has two axes; the possibility
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of creating the concept, and desirability of the result. This chart can be used to sort a large number of ideas and is a good starting point for discussions. It has a prospective perspective that the discussion can be based on.

- *Self-organized initiative* is the building stone of many Appreciative Inquiry summits' action phases. It implies that people choose what they desire to work on and then inspires others to join them. This method might be good to use actively with a large amount of people, where it is possible to have several projects going on at the same time (Ludema et al., 2003).
- *Potential-decision-matrix* might be another way of making the selection process through a positive lens. It would imply to use a decision matrix as presented in section 5.2 but with inputs matching the largest potential the concept could have. This would lead to discussions of potentials instead of discussions about limitations.

6.1.4 Product Development

The third phase is product development where the concept needs to be turned into a formulated product. In this phase much of the technical engineering has to be carried out, but there is also a lot of design choices to make that can have a large impact on the final result. Many of the presented methods can be used again in this phase as it often consists of a new divergent as well as convergent phase. In the product development phase the product design has to be connected to a process design. This implies a need for integrative methods that allow the necessary knowledge to be connected. Again, the positive design approach offers a useful alternative to problem solving if the goal is to create a superior product and a process that can live up to the demands of a call for sustainability as described in section 4.3. This means that circular questions should be useful as well as generative conversations. In this phase it might also be valuable to remember the concern about minimizing the need for coordination as discussed in section 3.2.2. In the following some useful methods will be introduced.

Solution Based Development. The positive design approach is a valuable way of introducing the appreciative perspectives in the development phase. It implies a search for good solutions rather than to fix problems, and it also stresses the importance of the questions asked and the methods used. Solution based development should contain a focus on existing strengths that can be used to build on as well as a focus on the potentials that might arise. It would be obvious to begin the development phase with an Appreciative Inquiry Discovery activity that uncovers the strengths of the existing technology and competencies of the team members, and then use a Dream activity to begin the divergent phase. It would also be obvious to use circular questions in order to uncover more nuanced inputs to the task. Methods that could be used for this include:

- *Rapid prototyping* means to quickly create a physical prototype which can be used in an innovation phase. Having something physical enables new discussions and ways of intuitively testing the validity of a design. This can be a useful method in positive design where new and better solutions rather than more efficient solutions are demanded (Kelley, 2001).
- *Rapid modeling* is inspired by rapid prototyping and means to create a quick and rough mathematical model that illustrates the concept. This will allow for new discussions and enable a playful approach to the design process where new angles are investigated. It would be obvious to use computational methods of modeling with graphical outputs.

Large Group Involvement. It is possible to involve large groups in the development. When moving from a divergent phase to a convergent phase in large groups it is necessary to share results, ideas, and to use methods of involving people in sorting and prioritizing. The following methods might be useful in the development phase when involving a large group:

- *Open exhibition I* is a method of opening a process involving many people. The participants share their expectations and expert knowledge for the topic on a poster (either alone or in a small group). Then, there is an open exhibition where people can move around and talk about what they notice and identify opportunities for the development (Bjerring and Lindén, 2009).
- *Open exhibition II* is a method of sharing ideas and knowledge to inspire others in their work. The participants prepare their input on a poster or other creative way. When everyone is done, there is an open exhibition where people can move around and talk to each other inspired by the input on the posters.
- *Online Platforms* would be useful just-in-time structures to include in the development phase. It would be possible to involve a large number of people in sharing knowledge about different subjects. Engineers could also use it to start innovative and generative dialogues with other experts or interest groups.
- *Appreciative Inquiry Summit* might also be useful as described in section 3.3.4.

6.1.5 Production

The final phase of the conventional product development process is the production phase. Here, traditional chemical engineering is used, i.e. chemical process design, up-scaling of processes, equipment design, calibration, quality control, etc.

The production phase has not been the focus of this report, but a few brief remarks will be given about the use of Appreciative Inquiry in this phase.

In general Appreciative Inquiry offers a useful way of data collection with its 4-D Cycle. While data is collected during Discovery, new ideas can be brought forth during Dream, and then people can be part of constructing how to make them happen in the Design phase, while making them happen in the Destiny phase. Not only is it a generative and prospective way of collecting data, it also engages people to be part of the subsequent action. The approach is focused on improvements with its positive lens and it is still focused on sustaining the positive core.

Another approach to continuously increasing efficiency is LEAN. Appreciative Inquiry has been used together with LEAN as an involving and action-focused inquiry, termed AI-LEAN (Bjerring and Lindén, 2009; Storch, 2009; Stratton-Berkessel, 2009). Another example is implementation of Kaizen with Appreciative Inquiry (Christiansen and Johansen, 2006). These approaches could have been interesting to investigate further for use in the production phase.

The appreciative approach also offers new possibilities regarding quality control. Internal and external auditing might focus more on generativity and improvements rather than testing. This could lead to better quality in the process.

It might be useful to keep in mind that the problem-solving approach is well developed and appropriate for many tasks. As Faust (2008) points out the appreciative approach is not yet developed in the final shaping step of a creation process. This means that the good old problem solving regarding process design should still be applied when necessary, although the outcome might be enhanced by asking good generative questions.

In the production phase of product development there is a need for continuous improvements of the processes as well as sustaining good relations with the employees. An example from a recent case can describe the potential of Appreciative Inquiry in the production phase.

In a case from a Danish company in the chemical industry a factory was out-phasing its product. The sickness absence was doubled and morale decreasing. The production factory started an intervention by Appreciative Inquiry to reduce the absence. Quickly, they were questioned what they wanted instead of a lower sickness absence, and what success they wanted two years from now. The answer was to win the offer for producing the replacement for the out-phased product. This change in perspective from problem to a positive desire ended up being crucial for the factory's future. During the following months a mental turnaround happened in the production department where they started to focus on their strengths, to involve the entire department, immediate action, and appreciation. The intervention was implemented into the existing LEAN approach in the company, and the numbers after the intervention document the success: Unit price reduced by 17 %, product deviations reduced by 90 %, and sickness absence reduced by 50 %. They optimized the internal processes and also ended up

winning the offer of producing the new product. In this way the employees kept their jobs and the factory. The case ended up winning the consultant prize 2009 from the Danish Management Board (Resonans, 2009).

The example shows how Appreciative Inquiry can be used successfully in a chemical production company both in terms of optimizing internal processes and at the same by enhancing employee satisfaction and performance.

6.1.6 Appreciative Evaluation

As described in section 3.3.7 the appreciative approach to evaluation can yield successful results. The strength based and prospective approach is valuable for sustaining and sharing knowledge. Chemical engineering companies often rely heavily on knowledge and experience. It is therefore necessary to have an extra focus on knowledge sharing structures and on the opportunities for this during an evaluation. Methods to use for appreciative evaluation and knowledge sharing include:

- *Evaluation Café* can be a cozy and effective way to get a status on something or to evaluate. It is basically about having three tables with summarizing, generating, and adjusting perspectives, respectively. About five questions should be prefabricated for each perspective, and the participants are invited to create their own questions if they think it could add something. In the first round the participants attend all of the tables and answer the most interesting questions for them. In the second round everybody moves from one table to the other while a facilitator interviews the participants about specially interesting answers. The strength of this method is that a shared picture of an evaluation can be created fast and show forward pointing answers (Bjerring and Lindén, 2009).
- *Storyline* is a method for summarizing a process and for sharing of knowledge. In smaller groups the people draw on posters their most important input to the topic. Then all poster are organized chronologically as a story line of the process, they have been involved in. Finally the participants move through them all and discuss the most important key points for summarizing, evaluating, or sharing knowledge (Bjerring and Lindén, 2009).

In this section suggestions have been given on how to introduce appreciative principles and methods into the conventional process of chemical product development. In the following section a new process model for appreciative chemical product development will be introduced.

6.2 Appreciative Process for Chemical Product Development

The aim of this section is to present a process model for appreciative chemical product development based on Appreciative Inquiry principles and the 4-D Cycle. The process model is also based on the concept of design with a positive lens (cf. section 3.1.2) where the design questions and methods are considered key for successful accomplishment. The positive design approach focuses on asking what gives life and what should be instead of solving problems.

Conventional phase models such as the ones presented in section 5.1.1 are popular for design processes because of their ability to break down the tasks. This allows for dividing it into individual activities that can be assigned to different people. These phase models are implicitly Cartesian (Kamata (2002)). Consequently, it is not surprising that working with models like this limits the thinking to a Cartesian way of thinking. The appreciative design model is intended to open up for other more resource oriented ways of thinking. The idea is to create a more integrated development process that sustains the overview. Too detailed subdivisions might lead to a loss of overview and lack of focus on the overall purpose. It might lead to silo solutions instead of elegantly integrated design. The appreciative approach invites to a focus on the positive design task with curiosity for exploring the task and appreciation of the involved people.

Faust (2008) presents a theory of design (cf. section 3.3.6) that shows the value of the design question and the appreciative approach in its shaping processes. He also states that the last phases of Appreciative Inquiry are not capable of processing the subtractive shaping that many design processes need. He therefore proposes that a design process based on Appreciative Inquiry includes activities which can carry out this kind of shaping, such as evaluation, prototyping, testing, production, and implementation. This perspective will be included in the model.

Zandee (2008) states that the first two phases of Appreciative Inquiry are often based on a poetic, narrative, and generative language, while the last two phases tend to be dominated by a logico-scientific language. She argues that the transformational power of an intervention might be even further enhanced by using the poetic language in the Design and Destiny phases. This might also be relevant in the case of process design.

Other principles and perspectives that have inspired the model are Managing as Designing (cf. section 3.1.1), appreciative organizational principles (cf. section 3.2.1), circular question types (cf. section 3.3.2), appreciative evaluation (cf. section 3.3.7), and Business as an Agent of World Benefit (cf. section 4.2).

6.2.1 Process Model for Appreciative Chemical Product Development

An appreciative process model for chemical product development is shown on Figure 6.1. It is based on the Appreciative Inquiry 4-D Cycle added the fifth D: Definition. It is also based on the contents of the conventional process model's four phases. The start-up phase is covered by the Definition phase, the concept generation and selection phase is largely covered by the Discovery and Dream phases, the product development phase is covered by the Design phase, and the production phase is covered by the Destiny phase.

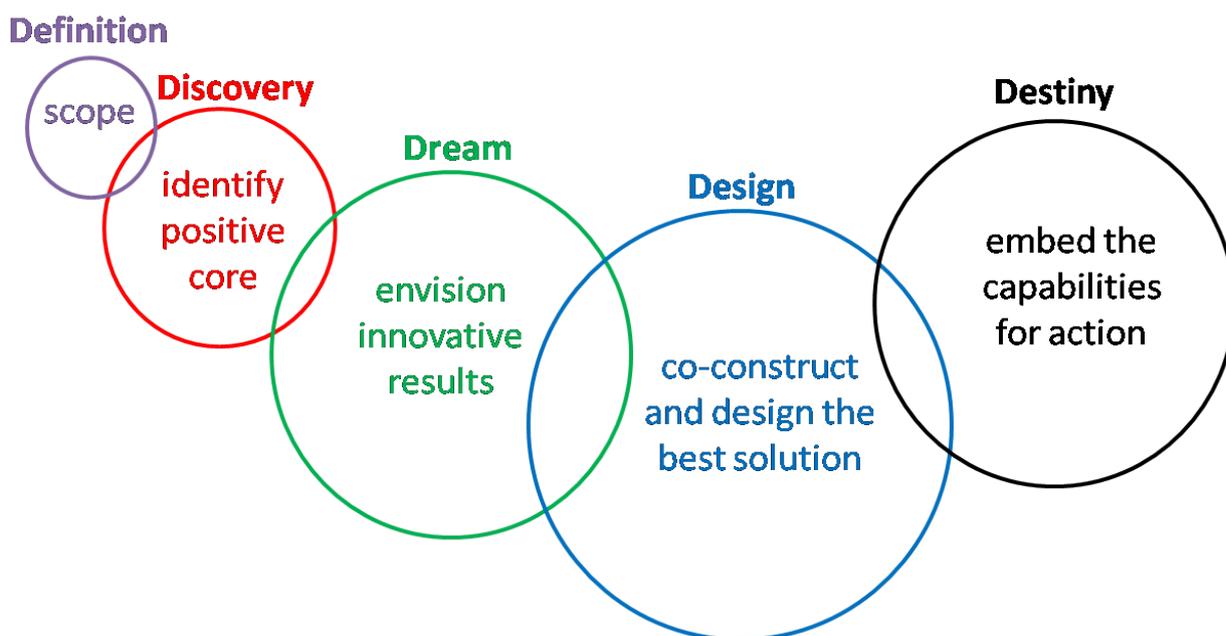


Figure 6.1: Process model for appreciative chemical product development.

The phases are overlapping as the figure shows. This means that they influence each other and are not distinct phases compared to the conventional process.

The Definition phase is about setting the scope and defining the boundaries for the product development, e.g. defined by legislation or quality standards. The Discovery phase is about appreciating what is best of the current, e.g. technology, processes, customers, etc., to identify the positive core to build from. The Dream phase is about envisioning the innovative results while expressing ideas, creativity, and voices of possibility. The Design phase is about cooperative constructing of the design for the product solution. The Destiny phase is about embedding the design in action and enabling continuous learning.

The Discovery and Dream phases are mostly carried out with a divergent character. The Design phase has both divergent and convergent character, and the Destiny phase is carried out with a convergent character.

Execution of the model implies a good mix of analytical skills and design skills. It is also

vital to incorporate good questions, and to create an appropriate organizational design to support the work of the product development process.

The fundamental difference between the conventional process and the suggested appreciative process model is the underlying assumptions about how the best solutions are created. Behind this model the assumptions are social constructionistic and appreciative which implies that the approach, the language, and the questions largely determine the possibilities of the solutions. This also means that it is concerned with the relations between the people as much as the relations between the tasks which are being carried out.

In the following the five phases of the appreciative process model for chemical product development will be explained further.

6.2.2 Definition

The Definition phase is about setting up the scope for the project and preparing the organization for the process. The people involved in this phase are sponsor of the project, relevant managers, and other resource people.

The tasks, methods, and outcomes of the phase are described in the following. It is valuable already in the definition phase to utilize the appreciative approach and language.

Tasks:

- *Defining the scope for the project.* The scope of the project could be to upgrade an existing product, develop a new product, or expand the company's product portfolio. The task is to define an overall strategic scope which is open enough to allow for new ideas and closed enough to allow for a meaningful use of time. The scope is often described as a one-liner in a positive and engaging style in present tense. The scope could also be formulated as a design question.
- *Identification of project boundaries.* Analysis of project boundaries such as defined by legislation, quality systems, company strategy, patenting strategy, etc. Boundaries also include preliminary budgeting.
- *Planning the process.* This includes decisions about what methods to use during the rest of the process as well as whom to include, herein internal as well as external relationships.

Methods:

- Meetings.
 - Appreciative Interviews.
-

- A mini-4D-process for the sponsor and planning team.
- See section 6.1.2 for more ideas to methods in the Definition phase.

Outcomes:

- Scope of the project: An engaging one-liner for the inquiry. A design question.
- Definition of the project boundaries.
- Establishment of a planning team.
- Overall plan of the process: Including a preliminary estimation of allocated resources and time, the necessary structures and methods.

In the Definition phase it might be relevant to engage facilitators, consultants, or other resource people who can help catalyze the process. The plans made in this phase should be good enough to make the process running but they should be up for review at a later stage if necessary.

6.2.3 Discovery

The Discovery phase is about mobilizing the whole system of stakeholders in identifying and exploring the positive core to build on. It is about finding the greatest experiences and potentials within the organization and its relations. The appreciative approach to identify great experiences and competencies is to search in the success stories that each person brings. The Discovery phase is also about identifying the potentials in the customers' stories. The Discovery phase is a search for the best of "what is" and "has been". In a broad sense it covers the basic data collection of the overall process. One of the key differences between the conventional process and the appreciative process can be found in the Discovery phase. Not only does it collect data about customer needs, it also aims at generating solutions and new ideas at the same time. The data collection and the concept development happens simultaneously, just as analysis and implementation does it in Appreciative Inquiry (cf. section 2.3.1). This phase is preferably carried out with everyone gathered at the same place at the same time for example as an Appreciative Inquiry Summit (as described in section 3.3.4).

It is important to keep the Design with a Positive Lens (cf. section 3.1.2) approach to the data collection. Good questions are the key to a generative discovery phase. If the identification of needs becomes too problem oriented, the solution is also likely to become too narrow. Recall that the questions asked defines the arena for the answers given (cf. section 2.3.2).

In the Discovery phase it is important to include as many people as possible. All the people in the Development phase should be included, as well as customers, and other stakeholders.

It is also a good idea to have good process facilitators. The tasks, suggested methods, and outcomes of the Discovery phase are described in the following.

Tasks:

- *Planing of data collection:* Plan how to receive, process, and deliver data.
- *Inquiring about the best from each person:* Identifying key competencies for use in the process. Describe energizing work. Share stories of successes, strengths, vitality, confidence and pride.
- *Inquiring into the best of the organization:* Identifying key organizational advantages such as technology, knowledge, relations, facilities, etc.
- *Exploring costumer narratives:* Identifying their success stories with related products. Identifying needs and wants. Generating ideas for solutions to problems. Generate ideas for complimentary benefits.
- *Identification of shared values:* Both value in terms of working relations and in products.
- *Identification of stakeholders' values.*
- *Training in Positive Questions:* Give people experience in asking positive and generative questions.
- *Data processing:* Analysis, sorting, prioritization, and conversion of data into a more useful form.

Methods:

- Appreciative interviews.
- Circular and generative questions.
- Methods from Discovery of Strengths in the Team in section 6.1.2.
- Methods from Generative Identification of Needs in section 6.1.3.
- Analysis and sorting of collected data.
- Conversion of needs into quantitative preliminary specifications by chemical engineering methods (cf. Cussler and Moggridge, 2001).

Outcomes:

- Identification of the competencies in the team.
 - Identification of factors for energizing work.
 - Identification of values in the team.
 - Identification of efficient technologies, systems and other organizational advantages.
 - List of costumers' wants, needs, and ideas for improvements or new features.
-

- List of quantitative preliminary specifications divided into segments.
- Identification of value elements for the product.
- Identification of stakeholder values.
- Team members have more experience in using appreciative methods and questions.
- Respectful client and colleague interactions.
- Generative conversations between team members, costumers, and stakeholders.

A challenge for facilitating the Discovery phase is to allocate time in a beneficial way. According to Ludema et al. (2003) it is important to spend time on appreciative interviews because the energy means a lot for the rest of the process. On the other hand it is something that easily takes up a lot of time. Another challenge is how to facilitate the diverging and converging stages of the phase. Data collection and generative conversations are diverging and often engaging to be part of, while data analysis, prioritization, and conversion of needs to specifications are convergent and needs another mindset. It is important to have people and time allocated to satisfyingly do these tasks.

The conversion of needs into a preliminary list of specifications is a way of clarifying and specifying exactly what costumers need as well as what they do not need. It is a way of describing target goals rather than target dimensions. This means that if a costumer states that she needs to chew a gum for a long time, a good specification would be to identify the meaning of long time, because the gum does not have to be chewable for three hours if the costumer only needs to use it for two hours. The point in creating a segmented list of specifications is to clarify that different needs might come from different costumer groups who desire different products. Later in the process the choice will be made about what segment to use as target.

During the Discovery phase the involved people get energized by sharing stories of success and value. The relations between people are likely to be improved. The Discovery phase is closely connected to the Dream phase where the energy is utilized to elevate the ideas into new innovative concepts.

6.2.4 Dream

The Dream phase is about envisioning innovative concepts which answers what the world is calling for. The phase builds on the energy and discovered potentials and strengths explored in the Discovery phase. During the Dream phase the ideas that started taking form during the dialogues should be elevated to become even greater and more desirable. Possibilities never thought possible become real during a successful Dream phase. It is about creating conditions for heightened creativity, innovation, and expression of great ideas. It is the creation of “what might be”.

When new ideas evolve they can create needs that have not existed previously. Therefore the phases of identifying needs and creating ideas should happen simultaneously as described in the Discovery phase. This means that it is very beneficial to include customers in the Dream phase. Again, it should be noted that the Discovery and Dream phases could be carried out as an Appreciative Inquiry Summit. It could be planned as a Concept Generation Summit where decisions about needs were not carried out prematurely such as a traditional stage-gate model would tend to do according to the Managing as Designing attitude (cf. section 3.1.1).

The Dream phase is about creating a clear result oriented vision that builds on the discovered potential. In this phase it is also valuable to involve a lot of people. The main people being creative product developers, process facilitators, as well as customers, and stakeholders. The tasks, suggested methods, and outcomes of the Dream phase are described in the following.

Tasks:

- *Generation of new ideas to address the project scope:* Generation of a large quantity of ideas to address the project scope and satisfy customer needs (as well as creating new needs).
- *Elevation and development of ideas:* Improvement of ideas to make them more ambitious by generative conversations.
- *Envisioning of innovative concepts:* Connect ideas to create innovative concepts.
- *Formulation of specifications for each concept:* For each concept which addresses a specific customer group a list of quantitative specifications should be worked out.
- *Making new possibilities become real:* Create an environment where creativity, innovation, and ambition thrive.

Methods:

- Methods from Generative Identification of Needs in section 6.1.3.
- Methods from Dream about Innovative Products Generative in section 6.1.3.
- Rapid prototyping as described in section 6.1.4.
- Formulation of specifications by chemical engineering methods.

Outcomes:

- A number of developed ideas to address the project scope.
 - A number of innovative concepts.
 - Narrative rich descriptions and conceptualizations of the concepts.
 - Several lists of specifications that address different customer segments.
-

- Voices of optimism, creativity, and possibility.

The Dream phase should lead to a positive agenda where people are excited to elevate the concepts to address ambitious issues. It is primarily a divergent phase where creativity flourishes and new ideas develop. It also has some convergent character when ideas have to be connected into concepts that address a particular segment of needs.

During the Dream phase the customer needs are identified further by developing new ideas and concepts. Often, needs from different customer segments are identified. A generated concept will often only satisfy one segment of needs. This means that several concepts are generated during the Dream phase which address different customer segments. This of course leads to different lists of specifications. It is necessary to have in mind that the design approach should be based on the Design with a Positive Lens principles and not become too eager to divide the concepts up and finalize the solutions prematurely just because specifications are used.

The Dream phase leads to the creation of future positive images described in the form of innovative concepts. Due to its generative approach it leads people to envision what is possible in more ambitious ways. These visions are the building stone of the Design phase which is concerned with how they can be realized.

6.2.5 Design

The Design phase is the most complex part of the product development process because it simultaneously needs to integrate many different disciplines. The purpose of the phase is to answer the question “What should be?” This implies simultaneously selecting the segment and concept to go for, developing the concept technically to investigate its potential, and defining specifications that address the customer needs and are technically obtainable. While the product concept should be designed, the production process should also be designed. All of these activities represent simultaneous divergent and convergent phases. This is obviously not a simple task. The appreciative approach is to focus on strengths, solutions, and positive results. The time frame of this phase will typically be longer than the previous two phases.

Another issue to have in mind in the Design phase is the statement of Faust (2008) that illustrates how the warm and intuitive generating process could be used in design but also how the cold, logical, and subtractive generating process needs to be used in order to appropriately shape the design process. This implies to work with the tensions that exist in the field between these two opposites as well as emergence vs. determination (cf. section 3.2.5, Avital et al., 2006). The possibilities that exist in continued use of the poetic language should also be embraced as suggested by Zandee (2008).

The Design phase is solution and resource oriented as well as focused on involving a large number of people in co-constructing how to realize the product visions created in the Dream phase. This means that apart from designing the actual product, the social architecture of the project organization is designed to support the innovation. This includes considerations regarding technologies, structures, roles, relationships, systems, guidelines, etc.

The Design phase should design a technical concept and lead to a commitment to action for the involved people. This is also the phase where the discovered values from employees, costumers, and stakeholders should be realized. The people to involve include marketing experts, scientists, product designers, chemical product engineers, chemical process engineers, and process facilitators. The tasks, suggested methods, and outcomes of the Design phase are described in the following.

Tasks:

- *Selection of segment and concept to realize:* Market analysis to identify what concept has the best potential to realize the project scope.
- *Design of the concept:* Technical realization of the product including its formulation.
- *Final specifications:* Balanced choice of specifications reflecting costumer elasticity and technical obtainability.
- *Flow sheeting of the product:* Design of the production aspects of realizing the product.
- *Create a social architecture to support the development.*

Methods:

- Market analysis.
- Creation of provocative design propositions for products and for the social architecture.
- Rapid prototyping and Rapid modeling. (Exploration: Go for quantity. Building: Think with your hands. Role-play: Acting it out.)
- Methods from Appreciative Selection in section 6.1.3.
- Methods from Solution Based Development in section 6.1.4.
- Chemical process design methods.
- For creating a social architecture see methods from Appreciativization of the Organization in section 6.1.2.

Outcomes:

- Selection of concept and costumer segment target.
 - Technical design of concept for a new product.
 - Specifications for the new product.
-

- Flow sheet and chemical process design for production of the new product including quality and sustainability issues.
- An appreciative organizational design that supports the Design and Destiny phases.

The first activity is to sort and select the concepts with the largest potential. This is done by letting people vote or by another way show their professional voice about what they believe has the largest potential and what they want to work on. This identifies a few high-potential concepts. The next stage is to create a high-potential-design-team with different competencies for each selected concept. It is preferable to let people choose what they favor to work on based on their belief in its potential. The engineers of the high-potential-design-teams then develop and test the technical potential of the concept and assess how good specifications they will be able to create. At the same time the marketing people analyze the market in order to identify the market potential, the competitors, etc. and assess the importance of each specification parameter in relation to the market potential. The next task is to connect these two assessments and identify what final specifications will have the highest potential. Two powerful methods in this phase are rapid prototyping and rapid modeling that both produce rough but very useful tools for discussing design. When the final specifications have been decided the design of the concept can continue with focus on its formulation, flow sheeting, etc.

Another important task in the Design phase is to let people create the organizational design that best supports their needs. This includes creating the relational processes that allows the right people to be included at the right time, and to establish communication systems which support the necessary information. A potent parameter in organizational design is openness to improvisation. This means that it should be made clear how people can improvise to improve their organizational needs.

The Design phase should create commitment to action, energy for change, and personal responsibility. This happens while the product is getting ready for production in the following phase, the Destiny phase.

6.2.6 Destiny

The Destiny phase is about action and practical implementation. It is focused on creating the conditions for a good result and continuous renewal. This means to embed the capabilities for learning, continuous improvements, knowledge sharing, etc. It also means to sustain the energy and momentum which has been created in the previous phases and use it in the implementation.

This phase is dominated by traditional chemical process engineers but opposed to the conventional process, it also focuses on the integration of other competencies and skills. One

aspect to note is the implications the process design can have for the product outcome. This means that product engineers should cooperate with process engineers to create an alignment of strengths in this phase.

For the product development the Destiny phase includes turning the concept and the chemical process design into actual production. For the people it means to embed the knowledge, ideas, motivation, willingness to change, and ability to adapt into the future work. The sum of these two creates the implementation of the product and continuous improvement of it.

In some cases the development will lead to establishing a whole new plant. In others it is possible to utilize existing process equipment. In most cases some existing equipment can be used and some has to be bought. The economical aspects of obtaining new equipment have to be analyzed in this phase as well as the different operation costs implied in choosing different production processes (i.e. analysis of fixed cost versus variable cost). Preferably this discussion has already been initiated during the design phase when selecting among concepts.

The tasks involved in the Destiny phase are similar to the ones involved in the conventional production phase. The difference is basically the appreciative and positive design approach and the focus on sustaining the momentum from the previous three phases. The Destiny phase is focused on ensuring the motivation of the people and their contribution after the phase.

In the Destiny phase the people to involve include purchasing agents, process designers, facility technicians, and economical analysts. The tasks, suggested methods, and outcomes of the Destiny phase are described in the following.

Tasks:

- *Pilot plant tests:* To gather more information and validate the process design.
 - *Up-scaling:* Designing the actual plant. Calculating sizes of equipment.
 - *Perform economical trade-offs:* Deciding the balances between fixed cost and variable cost for establishment of the plant.
 - *Implementation of the process design:* Obtain necessary equipment, calculate process conditions, perform quality assessments, etc.
 - *Plan how to improve the process in the future:* Invite people to continue the positive design approach to create valuable improvements in the future.
 - *Continuous market analyses:* To validate specifications. To search for new opportunities.
 - *Selling the product:* The conditions for selling the product should be created in this phase.
-

- *Embed the capabilities of learning:* Implement the appreciative approach in other systems and processes.
- *Getting ready for manufacturing:* Sharing of knowledge between development and operation people.

Methods:

- See section 6.1.5 for inspiration.
- Chemical process design methods.
- Methods from Appreciative Evaluation and Knowledge Sharing in section 6.1.6.
- Upgrade of the social architecture (cf. chapter 9 in Ludema et al., 2003, for inspiration).

Outcomes:

- Establishment of a production plant.
- Production of the product.
- People are committed to continuously improving the system.
- Transfer of relevant knowledge to the people in charge of operations as well as upgrade of the social architecture.

After the Destiny phase the established production facility has to be operated. Then, the situation is no longer product development, but product manufacturing. It is valuable to sustain the built-up momentum in order to continuously develop and improve the process. There are still a lot of tasks which need to be followed up on after the Destiny phase. The upgrade of the social architecture should incorporate the connections between the operational people and the development people for relevant following up.

After the Destiny phase the power of inspired action should lead to continuous optimization and innovation by positive self organization. This is the phase for generative action and improvisational change that supports the operations.

The Destiny phase concludes the product development. It is the transition to a new phase of operation. The 4-D Cycle can then be started over with a new project scope while the newly established operation is continuing to develop.

6.2.7 Discussion of the Validity of the Process Model

The presented process model of appreciative chemical product development is a suggestion for how to carry out product development with the principles of Appreciative Inquiry. The model is theoretically grounded in the theories presented in this report. The construction

criteria of the model have been to embrace the principles of Appreciative Inquiry as well as covering all the elements of the conventional chemical product development process. This means that it incorporates the same output that the conventional process does. The deliveries that are used as the basis of each decision gate in the conventional process such as the target specifications, concepts for selection, refined specifications, etc., are produced as a part of the appreciative process model.

Figure 6.2 shows how the appreciative model incorporates the elements of the conventional process.

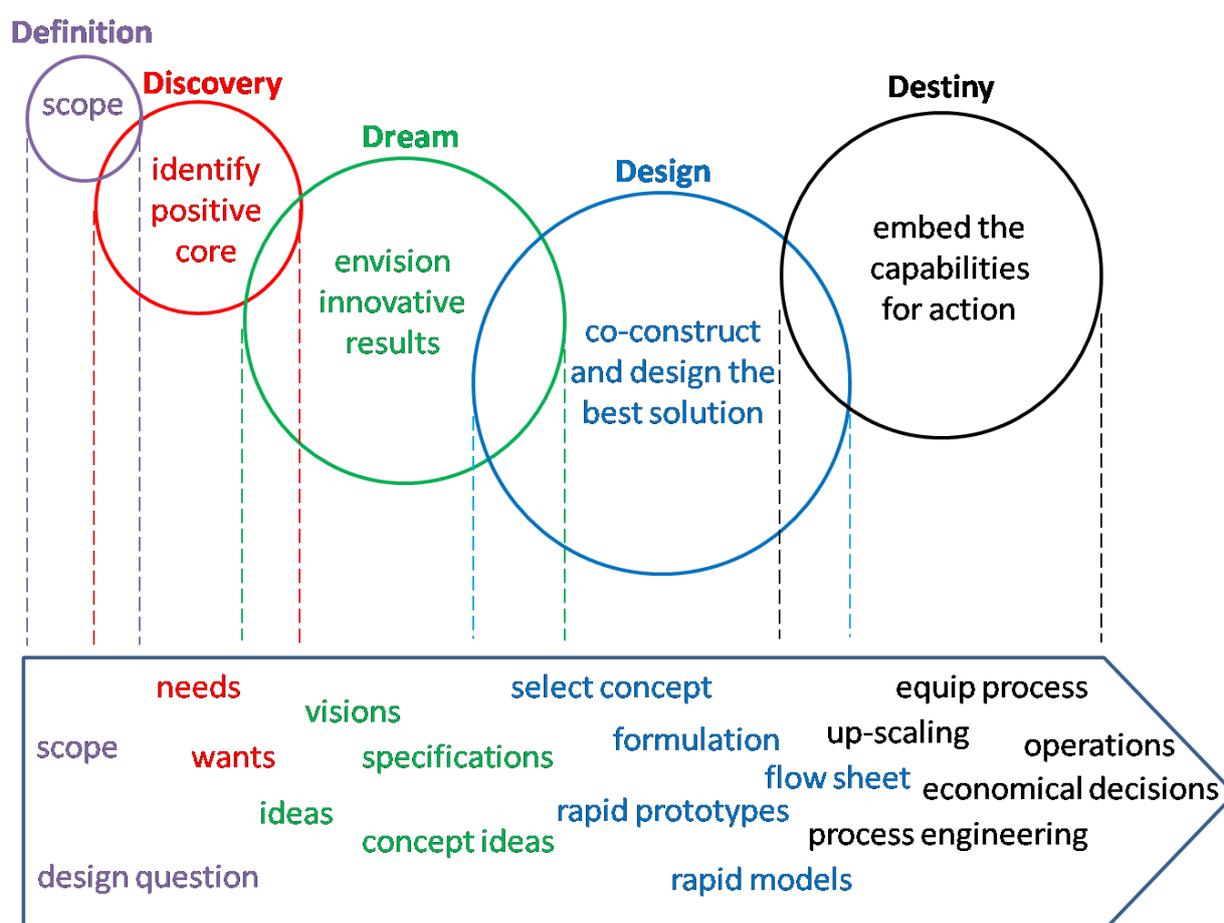


Figure 6.2: The appreciative process model of chemical product development and the elements it incorporates from the conventional process.

The conventional process has four phases. The contents in the project start-up phase are covered during the Definition phase. The contents in the concept generation and selection phase can roughly be divided into five steps: Identification of customer needs, establishment of target specifications, generation of product concepts, selection of a concept, and refinement of specifications. The first, second, and third steps are covered continuously during the Discovery, Dream, and Design phases. The last two steps are covered during the Design

phase. The contents of the conventional product development phase are covered during the Design phase. The contents of the production phase are covered during the Destiny phase. This concludes that the appreciative process model covers the contents of the conventional model and is therefore valid as a chemical product development process.

The appreciative process model incorporates more than the conventional process since it is more concerned with the design approach as well as the relations between the people. The validity of its focus on these aspects can be discussed in relation to the presented appreciative theories. Since the process model incorporates appreciative methods and positive design approaches, it is logically coherent with the presented theories. The process even reflects on the discussions about tensions to embrace and suggestions for improvements of the appreciative approach which have been presented in the report.

These two perspectives conclude the logical validity of the model as a process for chemical product development.

Three final discussions conclude this section. The first is what required prerequisites an organization needs in order to use the appreciative process model. An organization that wants to begin using the appreciative process model should be ready to embrace Appreciative Inquiry. This means that the relevant decision bodies should be willing to support the change that can come with this more dynamical and less controllable approach. Formal education in the appreciative approaches can be carried out before initiating the process but education can also happen simultaneously as a part of the process. Most Appreciative Inquiry interventions are carried out in places where the approach is new and the methodology is therefore well developed for introduction to new people. A requirement for the process to be carried out successfully is a good planning team to carry out the coordination and integration between practical as well as political issues. The most important requirement is probably to have good appreciative process facilitators to carry out the appreciative methods and processes. These can come from the company or be external consultants.

What tools for control of time, resources, and quality are incorporated in the process model? Most project management tools are designed to enable managers to control resources, time, and quality. The appreciative process model does not immediately seem to incorporate these tools. The process model does not stress the importance of these issues because it focuses on speaking about generation of innovative solutions and positive results rather than control. When this is stated, project management tools are still valid to use to set up the framework for the process. The different phases should be controlled in relation to resources, time, and quality. Basic change management skills and tools are also necessary for an Appreciative Inquiry process to be successfully carried out.

What could be expected of outcome by using the appreciative process model? Successful use of the appreciative process model should create new results for an organization. Its

aim is to create better products for the company to sell. The approach is different than the conventional because it stresses the importance of getting the most out of the involved people while it also stresses the possibilities in using another design process than problem solving. This means that successful outcome from using the process model should be better development of products which includes faster development with fewer resources of a better product. At the same time the appreciative approach should develop the people in the organization, their internal relations, and the company's external relations.

6.2.8 Future Test of the Process Model

The presented process model is theoretically grounded. It has not been tested empirically or been assessed by experienced product developers. It would be interesting to test the process model in the future by empirical studies. Appreciative Inquiry offers good approaches to action studies that might be relevant to investigate further before planning the study (Cooperrider et al., 2008f).

The first step of an empirical study would be to have a company use the process model for a chemical product development project. During the study, interesting observations and experiences should be noted for later use. During and after the process people should be interviewed in order to describe whether they considered the new model to yield better results than the conventional. This could be in relation to faster development, fewer resources, better results, or better personal experiences.

After the process, quantitative results could be compared to investigate whether the process actually did create better results in one or more of the relevant dimensions. The quantitative test would be difficult to ground without a large data collection because development process can be very different, and the uncertainty could be high for a single experiment.

After the tests the process model could be improved based on the observations and feedback. New methods could also be continuously added to the model.

6.3 Perspectives

In this chapter two ways of introducing the appreciative approach in chemical product development have been presented. The first describes how Appreciative Inquiry methods can be used in the different phases of the conventional process for chemical product development. This includes numerous practical examples of methods.

In the second part of the chapter a new appreciative process model for chemical product development has been presented. It incorporates the elements of the conventional process into

the Appreciative Inquiry 4-D model in a version designed for chemical product engineering. The process model describes how the positive design approach can be used for product development and how it can develop the implied people and organizations. The process model also gives suggestions to the use of specific methods during the process.

The process model has been theoretically developed and has not been tested empirically. The next step of validating it could be to use in practice and to investigate its outcomes.

I believe the appreciative approach will be embraced in the future. It has a huge potential for binding people together to address the challenges we have in our globalizing world. Likewise, it does have a huge potential for use with our coming generations who have been raised with just in time structures and interactive systems. They will be used to working in ways that the appreciative approach supports. Therefore, I believe that development through an appreciative lens will be valuable in the future. This has been the first important step.

Conclusion

In this thesis, possible applications of Appreciative Inquiry in chemical engineering have been investigated. Four organizational subsystems have been explored; people, structure, task, and technology, and the knowledge from this exploration have been used to create suggestions to applications of Appreciative Inquiry in chemical product development.

In the people subsystem the theories behind Appreciative Inquiry, Positive Psychology, Positive Organizational Scholarship, and Social Constructionism have been investigated by an extensive literature survey. This has led to a contextual understanding of the epistemology of Social Constructionism and the theoretical background of the positive revolution, herein an identification of the practical implications of embracing Social Constructionism in organizations. Suggestions for key factors leading to transformational change by using Appreciative Inquiry have been presented, namely the concept of generativity.

Within the structure subsystem, organizational discourses related to Appreciative Inquiry have been presented, herein, Managing as Designing, Design with a Positive Lens, and Appreciative Organizing. They have been used to discuss how organizations can be designed to embrace the appreciative approach. A model for understanding the facets of Appreciative Organizations has also been presented. It has been shown that engineering companies can use appreciative principles in their organizational structure.

The Design with a Positive Lens perspective has led to an understanding of the role of questions in design processes. This has been used to investigate design processes further

through an appreciative perspective with inspiration from artistic processes. It has been shown that a positive lens approach to design processes can be used in engineering. This includes the concept of circular questions, appreciative evaluation, and the Appreciative Inquiry 4-D Cycle process.

The task subsystem has been investigated regarding the role of the business purpose within an appreciative approach. It has been investigated how the appreciative approach can influence the purpose and how a meaningful purpose can support the employees in their work. It has been found that high meaningfulness can lead to higher performance.

The Business as an Agent of World Benefit perspective has been presented. It has been shown how Appreciative Inquiry can be used to turn sustainability in to a business opportunity for chemical engineering companies. This finding has been further elaborated by introducing the perspective of Green Chemistry and by discussing how chemical product engineering can embrace sustainability in its design processes.

The technology subsystem has been analyzed in order to understand the conventional process of chemical product development, including a description of the changes which has happened within the field during the past decades.

Suggestions on how to introduce Appreciative Inquiry principles and methods into the conventional process of chemical product development has been presented. It has been argued how these principles and methods can benefit chemical product development from the perspective of its new demands after the past decade's changes.

A process model for appreciative chemical product development has been presented as well as suggested methods for applying it. It has been shown that it is theoretically valid for chemical product development because it incorporates all the elements of the conventional process. It has also been shown that it is logically coherent with the appreciative theories. The appreciative process model has not been tested empirically but suggestions for future research are presented. The appreciative process model represents one of the first successful applications of Appreciative Inquiry in a context of engineering design.

The presented application of Appreciative Inquiry in engineering is the first step in the direction of generative product development.

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