biomatrix web

simplicity underlying complexity

Biomatrix Design Course

Systemic Problem (Dis)Solving

Manual

BiomatrixWeb

Table of contents

Introduction **3**

Part 1: Theoretical Background **5**
- Visual summary 5
- Summary of theory 5
- Self-reflection 12

Part 2: Steps in Ideal System (Re)Design **13**

Overview **13**
- Visual summary 13
- Theoretical background 13

Step 1: Choose a framework **15**
- Visual summary 15
- Theoretical background 16
- Overview of methodology 16
- Self-reflection 18

Step 2: Explore and analyse problems **19**
- Visual summary 19
- Theoretical background 19
- Overview of methodology 23
- Exercises 26

Step 3: Brainstorming **30**
- Visual summary 30
- Theoretical background 30
- Overview of methodology 30
- Exercises 32

Step 4: Compile a design notebook **36**
- Theoretical background 36
- Overview of methodology 36
- Exercise 37

Introduction to step 5: Create an ideal design **38**
- Theoretical background 38
- Overview of methodology 38
- Exercise 38

Introduction to step 6: Make an implementation plan **40**
- Theoretical background 40
- Overview of methodology 40
- Exercises 41

Introduction to step 7: Implement the design **42**
- Theoretical background 42
- Overview of methodology 42
- Exercise 42

Module summary **43**
- Theoretical background 43
- Self-reflection on the module 44
- Next modules 44

Introduction

The module on *Systemic Problem (Dis)Solving* explains the theoretical difference between problem solving and problem dissolving and outlines the methodology of problem dissolving through ideal system (re)design.

The purpose of the module is to

- create an understanding of the nature of systemic problems as compared to inherent problems
- generate understanding of the difference between problem solving and dissolving
- generate skills in systemic problem (dis)solving
- help (dis)solve personal, functional and organisational problems
- make you more innovative and creative
- generate innovative ideas relating to your case study.

You are going to watch video lectures that explain the theory and give practical examples for easier understanding. Then you are going to apply each of the concepts in a series of exercises to your case study the same way as in the previous module.

Your case study

The course is designed to continue the same case study throughout.

You will add to and process the information you generated in the previous module. You will brainstorm ideals and strategies for (dis)solving the problems associated with your case study and also do a first iteration of the ideal (re)design.

In summary, the flow of the case study through the course is as follows:

- In module 1 on *Overview of General and Biomatrix Systems Theory* you identified problems associated with your case study.
- In module 2 on *Systemic Problem (Dis)Solving* you brainstorm ideals and strategies for (dis)solving the problems you have surfaced.
- In module 3 on *Seven System Forces: Activity System Perspective* you get an overview of the seven forces of system organisation and create an ideal design for your case study.
- In module 4 on *Implementation Planning* you explore the implementation of your ideal.
- Module 5 on *Systemic Change Management* explains the generic principles of how systems change and develop. It also provides methods for managing and facilitating each step in the methodology discussed in module 2.

Getting the most from the module

1. Watch the whole video series

Before working your way through the module one section at a time, watch the whole video series to get a broad overview.

Do not stress if you do not understand everything in the first viewing. One cannot understand a single systems concept fully before one understands them all. Systems thinking requires iterative learning, so be prepared for the tension of incomplete knowing. Your questions will very likely be answered in one of the following video lectures.

2. Work with one section at a time

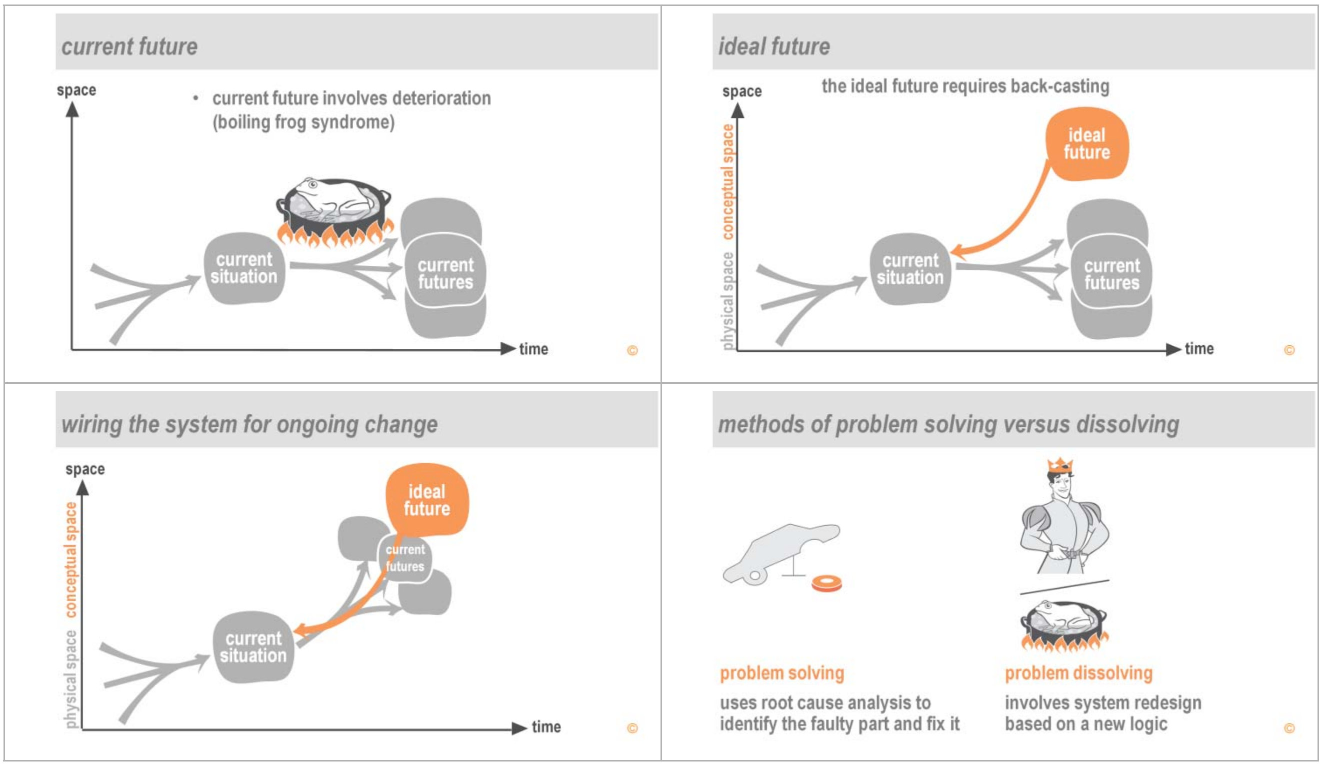
The content of the knowledge provided in the videos, summary of theory and additional reading is the same. However, there are differences in emphasis and the level of detail for the sake of deepening insights and providing additional explanations.

When working with individual sections:

- Watch the relevant **video** again.
- Read the **summary of theory**. You can do so either online or download the manual.
- Go through **additional reading**.
- Do the prescribed **exercises** to apply the new concepts to your case study. Some of the exercises you will fill in within the e-learning platform. Others - where data needs to flow from one exercise to the next or from one module to the next - you will be asked to answer in your Google sheet, a link for which is provided in the Resources section.
- Do the **self-reflection** and **contextual reflections,** there is no real learning without reflection.

Part 1:
Theoretical Background

Visual summary



Summary of theory

Current versus ideal future(s)

This section reviews what was discussed in the previous module and elaborates on it.

The concepts of ideal and current futures are associated with the concepts of problem solving and dissolving. In summary:

- A **current future** is the result of more of the same behaviour (or continued functioning of a system in the same manner). The habitual behaviour acts as momentum that **pushes** the system into one of several possible future outcomes, into a current future.
- The **ideal future** is deliberately chosen by the system. It represents a different system functioning – i.e. a transformation of the system. Once designed, the ideal future acts as an inspiration to develop strategies that will lead the system towards the outcomes described by the ideal future. Thus it acts as a **pull** factor. As the system implements the new strategies and starts changing its functioning accordingly, it will get transformed.

Current futures

Systems change over time. The current situation of a system (or issue) was co-produced by the decisions and behaviour of the system itself, by changes in its outer and inner environment and by how the system perceived and dealt with these changes. In fact, as its environment changes, the system will have to change in order to survive and thrive in the new environment.

The current situation has **momentum**. It drives the system to carry on behaving in the same manner as it currently does. *Momentum can be illustrated by the behaviour of a tanker that runs aground on a sloping sandy beach. It will slide onto the land as a result of its momentum.*

Momentum is derived from the size, weight and speed with which the system moves, as well as the conditions of the environment *(e.g. resistance by the gradient of the land and the shore being rocky or sandy).*

In an organisation the momentum is derived from the interaction of co-factors like the current values, beliefs, habits, strategies, policies, structures, aims, behaviour patterns, resource availability, capabilities, etc. These factors represent **the current logic** from which the momentum arises.

The larger the organisation, the longer it will take to transform it, due to its momentum.

The momentum, derived from the current logic, propels the system to carry on behaving in the same way as in the past. This is the basis for **forecasting**.

If the current behaviour of the system is projected into the future, it produces a range of current futures. The reason why there will be a range of possible current futures is that environmental change is not predictable. Depending on how the environment will change, the current behaviour will achieve different results. Thus the future of a system is not predictable.

Current futures usually imply deteriorating trends, because behaviour that is appropriate now will not necessarily be so in a changed environment. *For example, the strategies and products of today will soon be out of date. New strategies and products will have to be invented and produced.*

A deteriorating situation is often referred to as "**boiling frog syndrome**". Apparently, if a frog is thrown into hot water, it will jump out, but if it is put into cold water which is heated very slowly, it adapts until it is boiled. This is an analogy for being unaware of a gradually deteriorating situation which is looked at from one moment in time to the next. The current situation does not seem much worse than the recent past. However, if looked at over longer periods of time, it gets drastically worse.

The current situation and its futures contain contradictions. This means that only some of the current aspects of the system produce problems, while others are desirable and could be the basis of a system transformation. Put simply, each system has strengths and weaknesses. Transforming the system implies building on and amplifying its strengths and transforming or eliminating / reducing its weaknesses.

Ideal future

The ideal future refers to a state of the system in future that is desirable. It represents an ideal design of the system.

Ideal designs are associated with human systems, which can deliberately co-create their destiny on the basis of a creative choice. By comparison, the destiny of systems in nature is determined by laws of nature. These laws represent preferred outcomes that have evolved over time.

An ideal design (like a description of a law of nature) resides in **conceptual space**. It is a construct of the human mind. It is an idea.

Ideals are ideas that – by definition – cannot be attained. They are idealisations that can only be approximated. Or if they are apparently attained, they can immediately be re-interpreted. They shift and invite us to go beyond. *For example, beauty is an unattainable ideal. If we nevertheless think that we have attained it, like the beautiful moment, or the beautiful thing, it has already moved on, while the ideal of beauty remains to inspire us in the next moment or for the next thing taking a differently unique characteristic of beauty.*

An ideal design is a creative construct. It is based on an ideal logic which is different from the logic of the current situation and current future. It is a higher order logic that transcends the current logic. *For example, the logic of the disease is not the logic of health. Health is achieved by different co-factors than those that co-produce disease. Moreover, as health is created, all diseases are dissolved. Likewise, the logic of fighting poverty differs from that of creating wealth or abundance.*

The ideal future involves **backcasting**. Once an ideal state or outcome (*e.g. health*) is chosen, it begs the question "How can I attain it?" The answer refers to strategies *(e.g. better nutrition, exercise, stress management, more rest, prevention of specific diseases, hygiene*) that will move the system towards the chosen ideal. In moving towards the ideal, the problem of disease dissolves.

The motivation that arouses the need for change is passion (Latin for suffering) while that of the ideal future is enthusiasm (Greek for God within or inspiration). Passion pushes the system towards changing itself, while enthusiasm inspires (pulls) it towards new ideas.

An ideal future inspires strategies that move the system – step by step – towards a new, more desirable future state. An ideal design represents a break in the current logic. It inspires new behaviour, based on a new logic.

Moving the system from the current situation towards its ideal future

In planning for the future, a system tends to always engage with both the current situation and its current futures and the ideal future (once it has deliberately chosen one).

The current situation embodies the momentum that pushes the system towards a current future. If this is not in the direction towards the ideal future, it needs to change course and continue to transform itself through behaviour based on the strategies inspired by its ideal future.

The transformation of the system is complete when the momentum of the current situation leads the system automatically towards its ideal future.

Inherent versus emergent problems

Systems thinking distinguishes between inherent and emergent properties of a system.

Since emergence is the essence of systems thinking, *emergent properties* are also referred to as *systemic properties*.

The term **property** *r*efers to a description of the appearance (or qualities, characteristics, attributes) of a system (or thing, issue, situation) and its behaviour (or functioning).

A **problem** is a property of a system that does not meet our desires, approval or declared aims. One can therefore distinguish inherent and systemic (i.e. emergent) problems.

Inherent versus systemic properties of a system

Inherent properties: The whole is the sum of its parts

An inherent property is a property of the whole system that resides in its parts. Irrespective of how it is distributed between the parts, the sum total remains the same at the level of the whole. *For* *example, the total number of persons or total budget available in an organisation remain the same (zero sum), irrespective of how they are distributed between its different functional parts. They can be distributed in different ways: as one department gets more people or money allocated, the other departments get accordingly less*.

Most quantitative measures applied to a system are inherent properties. They are governed by win / lose and zero sum.

Systemic properties: The whole is greater than the sum of its parts

A systemic property is one that is not inherent in the parts of a system but emerges in their interaction at the level of the whole and / or in interaction of the whole and its environment. *For example, driving emerges as a property at the level of the car from the interaction of its parts. None of the parts of a car can drive. New knowledge can emerge for the organisation as persons are shifted from one department to another and interact in new ways, even if the number of persons remains the same.*

Systemic properties are governed by win / win. They are synergistic and produce more and different outcomes than previously.

Measuring inherent and systemic properties

The reality of a system is composed of both inherent and systemic properties.

If only inherent qualities are considered – which is typically done by recognising only what can be quantitatively measured – one gets a wrong picture of the system. In fact, its essence may be lost.

This is a problem with the current scientific method (see section on Philosophy of systems theory in module 1). It is also observed in an organisational setting, where the quantitative measurement of the organisation does not reflect its systemic properties and may therefore be completely misleading about its value. The current emphasis on financial evaluation reinforces this error of judgement. Actually, the whole financial system is in itself based on this error.

The measurement problem is compounded as soon as the time perspective is introduced, where short-term quantitative measures dominate a longer-term perspective of both the quantitative and qualitative momentum of the current future and the quantitative and qualitative potential inherent in the ideal future. Again, this is largely the result of the dominance of the financial perspective in evaluation. It measures the current situation of a system *(e.g. a business organisation)* and fails to evaluate its current future momentum adequately. *A typical example is a strategy that delivers good annual results but jeopardises the longer-term future of the organisation.* It also fails to appropriately measure the impact from the ideal future *(e.g. potential new developments that arise from a good ideal future but need time to develop).* This short-term approach jeopardises the development of many systems.

This does not imply that systemic qualities could not be measured. However, this seems to require the use of fuzzy logic rather than conventional mathematical and statistical measures. It would also require a different ethos *(e.g. worldview)*, different organisation structures and regulation, amongst others.

Inherent versus systemic problems

Problems are properties ascribed to a system. Accordingly, there are inherent and systemic (or emergent) problems.

Inherent problems arise when a part of the system does not perform according to the prescribed (inherent) properties (or specifications). To solve the problem, the malfunctioning part needs to be fixed. This restores the system to its originally prescribed functioning, *as for example repairing the faulty part of a car.*

Systemic problems are those that arise from the interaction of parts and / or whole systems with each other. *For example, two potentially well functioning parts of a car cannot interact if they were not designed to do so (e.g. because they are derived from different car models). Thus, the problem is not in the parts per se, but their interaction. Two persons can produce a happy or unhappy relationship. By changing the nature of the interaction, their relationship can be transformed from unhappy to happy or vice versa. This could, but need not, involve major changes in one or both of the parts / partners.*

The following table compares the characteristics (or properties) of inherent problems with those of systemic problems:

Inherent Problems*	**Systemic Problems****
Problems are objectively given. They only need to be formulated.	Problems are difficult to delineate. They differ according to different stakeholders and dimensions. They span levels in the systems hierarchy.
A problem is a direct consequence of a single cause.	Problems emerge from interaction (*e.g. from the co-production of (mal)functioning parts of the system, conflict between a system and its outer and inner environment, even from the interaction of inherently well performing systems*).
A status quo description describes the problem.	The problem changes in time and space through interaction with other systems (i.e. systems are dynamic).
Behaviour of the system(s) is predictable. Understanding the problem requires sufficient information, which can be acquired through sustained effort in time.	Behaviour of the system(s) is unpredictable due to a large degree of "free will" of the interacting parts / systems, changes in the interacting systems and their environments as well as continuity of impact and emergence from interaction (i.e. systems dynamics).
The outcome and change are controllable and can be mastered.	Outcome and change are unpredictable, but can be managed.
Solutions are enforced.	Solutions require alignment and behaviour change in the system, its parts and stakeholders.
Solutions eliminate problems.	Due to ongoing environmental change and conflicting perspectives, there will always be conflict / problems. Solutions themselves could create new problems.
Problems can be solved.	Problems cannot be solved but need to be dissolved.

Source:

* based on Gomez, Gilbert, Probst
** Dostal

Problem solving versus dissolving

Problem solving

Problem solving is required if faults / mistakes occur in an otherwise well functioning system.

Solving a problem involves identifying the root-cause of malfunctioning within the system and ‘fixing’ the part which causes the problem. This type of intervention restores the system to the state it was in before the problem occurred. It restores the system to a **current future**. The intervention does not change the system itself. *For example, if the car breaks down, fixing the malfunctioning part restores the car to its previous functioning.*

Understanding the problem suggests the solution.

Problem dissolving

Problem dissolving is required if the problem is the result of emergence. This is typically the case if a system is problem riddled, does not improve after attempts at problem solving, becomes increasingly worse over time, creates problems for other stakeholders and is itself a victim of stakeholder actions.

Dissolving a problem involves redesigning the system. This design represents the **ideal future** of the system. As the system moves towards its ideal future, the problems dissolve. *For example, as one works towards creating health, the disease disappears*. *By redesigning a car, the problems derived from a faulty design will be eliminated; by redesigning the filing system, its current faults will not be recreated*.

Understanding the problems does not imply that one knows the solution. Rather, one needs a new logic to inspire new systems behaviour: the logic of how to create an ideal future and develop strategies to bring it about. *For example, understanding the occurrence of a disease (or an unhappy marriage or poverty in society) does not imply that one knows how to create health (or a happy marriage or prosperity for all).*

Understanding the problem does NOT suggest a solution.

Ideal design in the context of different types of systems

Natural systems function according to the laws of nature. They describe the evolved “Ideal” Design of the systems of nature. Deviating from them could imply problems. *For example, deviating from “healthy” functioning of the body implies disease. Likewise, ageing seems associated with a deviation from the original “design” as embedded in the DNA. Climatic changes cause problems for living organisms.*

At the same time, deviation from the current ideal design could also evolve the design. This can occur by natural evolution or deliberate human intervention as a result of technological evolution. *For example, genetic engineering represents changing the original “design” of nature with a more ideal design conceived by humans.*

In **technological systems**, the ideal design of an existing artefact is the design according to which it was produced.

Concerning the production of new and different artefacts, these require new designs, based on the changing needs of the users and changing technological capabilities in the course of time. The formulation of high level ideal designs can generate a series of new designs. *For example, the overarching ideal of Audi's "Vorsprung durch Technik" (i.e. "leaping ahead through technology") can give rise to a series of new car designs in accordance with technological advances and changing customer needs.*

Social systems do not have laws of nature determining their future. *For example, there are no laws of nature prescribing an ideal way of how to raise children, conduct one's personal relations, manage an organisation, or govern a society.* These are choices that humans have to make. As societies evolve, different choices are appropriate, given the changes in the environment that emerge over time. Creating ideal designs for social systems can dissolve current societal problems and create a more desirable future for humanity and its members.

Comparison between problem solving and dissolving

Both problem solving and dissolving are relevant in different contexts.

In most large change interventions *(e.g. in preparing an organisational transformation, or during societal problem dissolving),* both types of problems are present and hence both methods will be required. The so called "quick wins" in change interventions typically represent problems that can be solved quickly, while systemic problems can only disappear in the course of the actual transformation of the system.

In summary,

- problem solving **reforms** the system – it returns the system to its original form as a result of restoring its behaviour and functioning as determined by the original design of the system
- problem dissolving **transforms** the system – it creates a new form for the system as a result of the outcomes produced by its new behaviour and functioning.

If a system needs to be redesigned, it is likely to have several problems, not just one. And it is likely that these problems have been building up over time and keep changing.

By comparison, problems that need to be solved often appear to occur suddenly *(e.g. as a result of breakdown),* even if the malfunctioning has built up over time *(e.g. through wear and tear).*

The more problems a system has, the greater is its potential for transformation. **One cannot improve a perfect system!**

Systemic management

Systemic management implies the following:

Current futures and ideal future

- Understanding the momentum of the current situation of the system of origin, the stakeholders and environment of the project (the impacts can be associated with strengths or weaknesses, opportunities or threats as discussed in later section on *Brainstorming* as well as the section on the *Environment* in module 3)
- Understanding the role of an ideal future for a project, as well as the embeddedness of the project in a relationship with stakeholders and a broader environment.

- Ability to determine strategies that will allow the system to move towards its ideal. The strategies should ideally build on strengths and bypass or transform weaknesses. They should also take advantages of opportunities in the environment, bypass or transform threats and make contingency plans to respond to them. (Some practical tools that managers can use for this are discussed in the section on *Brainstorming* and in module 3.)

Inherent and systemic properties

All managers should be familiar with the distinction between inherent and systemic properties to be able to distinguish between problem solving and dissolving.

Problem solving and dissolving

Change managers should be familiar with the distinction between problem solving and dissolving, in order to design and facilitate a change intervention that is relevant to the nature and magnitude of the problem(s).

General managers should also be familiar with the distinction of problem solving and dissolving and use appropriate tools (*e.g. root cause analysis, stakeholder analysis, multi-dimensionality and systemic brainstorming techniques* and others discussed in modules 2 and 3) to deal with day to day problems.

Additional reading

It is useful to read the following sections of *Biomatrix: A Systems Approach to Organisational and Societal Change (3rd edition):*

Current versus ideal future: Temporal perspective (pages 139-147)

Problem solving and dissolving within the Biomatrix (pages 425-444)

Self-reflection

What is the relevance of these concepts and their application for your case study?

- current versus ideal future
- inherent versus systemic properties and problems
- problem solving versus dissolving

Contextual reflection

Choose a recent issue or development related to your case study (e.g. a new development in your personal environment, your industry, society or internationally) and comment on it from the perspective of the following concepts:

- current versus ideal future
- inherent versus systemic properties and problems
- problem solving versus dissolving

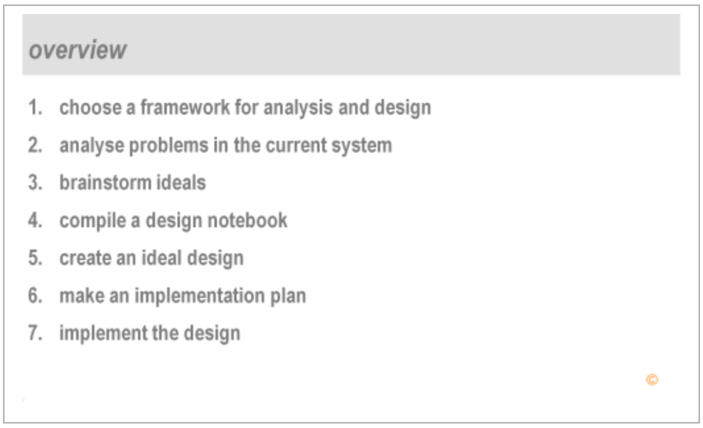
Can you identify a not previously considered problem or problem co-factor associated with any of the concepts? If yes, add it to your list of problems and problem co-factors.

Part 2:

Steps in Ideal System (Re)Design

Overview

Visual summary



Theoretical background

Types of ideal design approaches

Some systems thinkers (e.g. Ackoff, Gharajedaghi, Banathy) advocate “clean slate design”. This approach pretends that the system has been destroyed overnight, that only the resources of the system (*e.g. people, material things, money*) are left and that these need to be reorganised, based on an ideal outcome of the system.

It is our experience that only few people (i.e. the intuitive thinkers) are good at this and that many persons cannot come up with innovative ideas "out of the blue”, or are comfortable with new ideas that are apparently radically different from the current situation.

The Biomatrix ideal system (re)design methodology has therefore included a problem-based brainstorming method, as well as other creativity enhancing brainstorming techniques to enable all participants to become creative during brainstorming.

The methodology also separates the brainstorming from the design phase, freeing participants in a brainstorming meeting from the psychological pressure to come up with only apparently implementable ideas.

The pre-sorting, re-clustering and re-framing of ideas according to the design framework that occurs during compiling of the design notebook prepares for the creation of the ideal design.

Biomatrix systems theory distinguishes between different types of systems and provides different frameworks for each. These include frameworks that are also used by general systems theory (*e.g. stakeholder analysis and multi-dimensionality*), but it develops them further, besides adding new ones.

Steps in ideal system redesign

The Biomatrix courses and programmes use the following methodology for transforming a system on the basis of ideal system (re)design. It consists of the following steps:

1. Choose a framework for analysis and design
2. Explore / analyse problems in the current system
3. Brainstorm ideals and strategies
4. Compile a design notebook
5. Create an ideal design
6. Make an implementation plan
7. Implement the design

Additional reading

It is useful to read the following section of *Biomatrix: A Systems Approach to Organisational and Societal Change* (3rd edition):

Generic steps in ideal system redesign (pages 445-461)

Systemic management

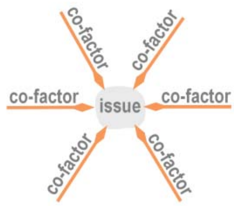
To facilitate large systems redesigns and their implementation requires that a dedicated change manager is familiar with the design steps and how to manage them. Training systems experts who can facilitate a systemic organisation transformation is one of the purposes of the *Biomatrix Organisation Transformation Programme.* Likewise, the purposes of the *Biomatrix Societal Transformation Programme* is to train experts who can facilitate the design of systemic public policy, strategies for dissolving societal and industry problems, amongst others.

We also believe that general managers would benefit by knowing the steps involved in redesigning a system and using some of the methods of problem exploration and systemic brainstorming during operational and strategic planning meetings. This would enhance creativity, encourage learning and make the organisation more systemic. To achieve this, this module can be shortened and customised for a wider roll-out within an organisation.

Step 1: Choose a framework

Visual summary

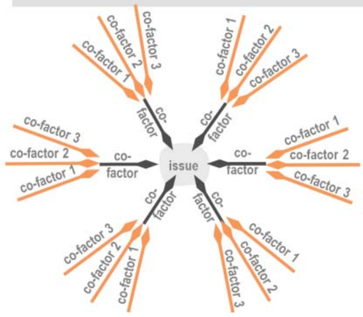
co-factor analysis



application:

- localised issue analysis (e.g. in planning meetings)
- to start brainstorming
- to get a "feel" for a system / issue

co-factor analysis: free flow



application:

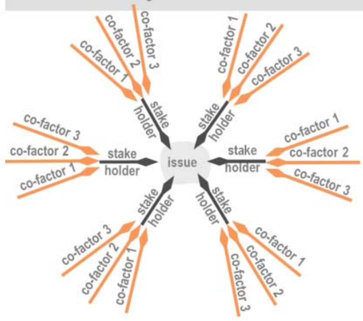
- localised issue analysis
- to start brainstorming
- to get a "feel" for a system / issue
- to widen analysis and deepen understanding, we plot co-co-factors
- this also identifies circular causation

co-factor analysis: stakeholder based

application:

- to identify stakeholders

co-factor analysis: stakeholder based



application:

- to identify stakeholders
- problem co-factors associated with each stakeholder (during problem analysis)
- concerns / needs / wants of each stakeholder (for ideal design)

co-factor analysis: multidimensional

application:

- to be more specific in analysis
- and even more specific through co-cofactor analysis

co-factor analysis: multidimensional

application:

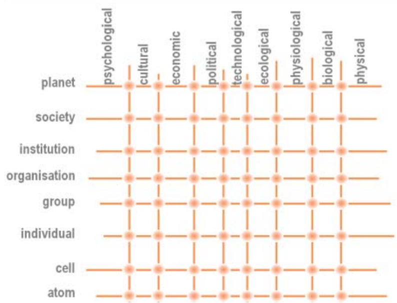
- to be more specific in analysis
- and even more specific through co-cofactor analysis

seven forces of system organisation

application:

- activity system analysis and (re)design
- entity system analysis and (re)design

multi-level / dimensional web of the biomatrix



application:

- societal problem (dis)solving
- public policy design
- supply chain (re)design

Theoretical background

Biomatrix systems theory can be applied in various ways to different types of systems and change situations. Different frameworks for the analysis and (re)design of a system can therefore be derived.

The (re)design of a system could involve a different framework than that used in problem analysis.

Overview of methodology

Types of frameworks

Co-factor analysis

The co-factor analysis framework is used in situations where there is a specific issue *(e.g. a systemic problem)* under consideration.

This framework is useful to

- explore problems that occur in the day to day business (*e.g. during operational meetings*) and that need a quick response
- elicit a free-flow of contributions
- make a "first pass" analysis of a complex problem (i.e. to get a "feeling" for it) before applying other frameworks
- identify stakeholders and determine their stake in the issue, system, problem, design and decision. A good design / decision meets the expectations of stakeholders and eliminates their concerns.

Co-factor analysis can be applied in variations, such as identifying

- co-factors in general (this involves questions "what caused or brought about the problem / issue?" "what else?")
- stakeholders and their stake (this could involve questions such as "what are the concerns about, expectations from, potential contributions to or impacts of the issue / system / problem / design / decision under consideration?")
- multi-dimensional co-factors (this involves the question "What are the psychological, cultural, economic, political, technological, ecological, physiological, biological and physical co-factors of the issue / system / problem / design / decision under consideration?").

While general co-factor analysis prompts a free-flow of input, stakeholder and multi-dimensional analysis generate more structured inputs. It is often useful to start with co-factors in general and then ask for additional inputs based on stakeholders and dimensions.

One can extend the application of the co-factor framework variations to a second round: for each co-factor, dimension or stakeholder in the first round more detail can be added in the second round in terms of co-factors, dimensions or stakeholders. (You learned about this framework already in the section on *Co-production* in module 1.)

To go into a second round is useful if one needs to go into greater detail in the analysis of an important issue. *An example could be an accident in an organisation.*

It is also useful in an education setting to demonstrate the systemic nature of an issue, because one will find a repetition of co-factors occurring between the first and second round and thereby also identify direct circular causation (see also the section on *Impact* in the previous module). Indirect circular causation becomes very obvious if one were to add a third round.

Seven forces of system organisation

The form and functioning of a system is co-produced by seven forces of organisation.

They provide a framework for analysis, redesign and development of both

- **activity systems** (*e.g. for project design, business process (re)design, functional (re)design and supply chain (re)design)*
- **entity systems** *(e.g. for organisation redesign, restructuring and transformation, as well as public sector partnership design)*

However, the seven forces operate differently in the context of activity and entity system (re)design (this is the subject of the following module).

Multi-level and multi-dimensional web of the biomatrix

This framework is used for analysing and dissolving systemic problems, such as complex societal problems like *poverty, conflict, infrastructure, industry problems or pollution*. These are problems that are not contained to one activity or entity system, but spread across and affect many systems in nature, society and technology.

It is used for

- public policy (re)design
- strategy designs in the public sector

It is also one of the frameworks used in the *Biomatrix Societal Transformation Programme*.

Additional reading

It is useful to read the following sections of *Biomatrix: A Systems Approach to Organisational and Societal Change (*3rd edition*):*

Different types of redesign (pages 463-491)

Systemic management

The choice of the right framework for the right context is most important as one gets the answers according to the questions asked. A framework guides the questions of the analyst and the ideas for the designs. Concepts that are not covered by a framework will not be explored and will be missed.

It is therefore important that change managers understand the frameworks and are familiar with the type of information they produce, in order to be able to select the right one for each change intervention.

Self-reflection

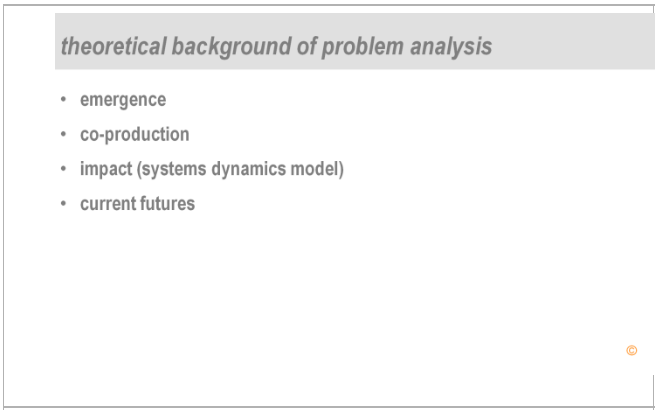
What is the relevance of the different types of frameworks for analysis and design and their application for your case study?

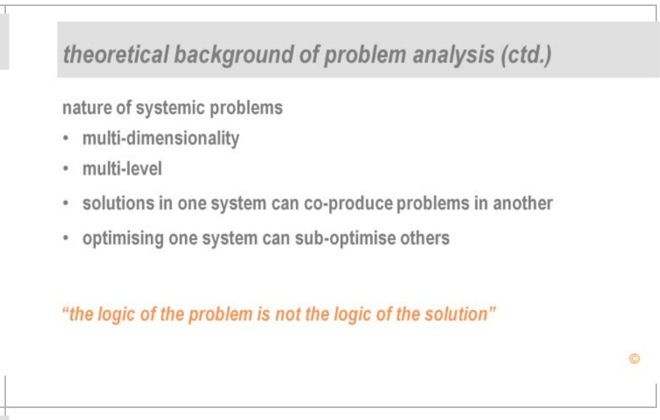
Contextual reflection

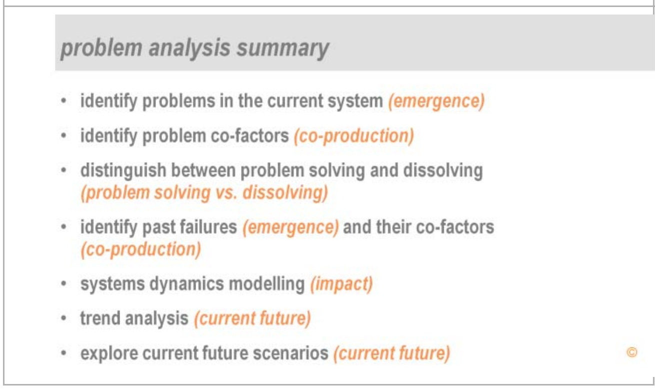
Comment on any issue (not necessarily related to your case study) that was recently reported in the media and that would have changed if a different framework for analysis or design would have been applied.

Step 2: Explore and analyse problems

Visual summary







Theoretical background

The nature of problems

This section briefly recapitulates some of the key concepts discussed in more detail in module 1 on *Overview of general and Biomatrix systems theory* in the context of systemic problems.

Problems contained in the current situation of a system include both types of problems, inherent and systemic (i.e. emergent) ones. Each type is derived from a different logic of functioning and requires different methods to deal with them.

Inherent problems

Inherent problems can be objectively described through a comparison with a design *(e.g. which part of the car malfunctions)* and its associated specifications *(e.g. how much it malfunctions)* and procedures *(e.g. how it malfunctions).*

To find out what the problem is requires root cause analysis. To solve it requires fixing the malfunctioning part(s) and restoring the system to its previous functioning.

In inherent problems the logic of the problem is the logic of the solution.

Systemic problems

Systemic problems are not clearly delineable for the following reasons:

Emergence

The problem is an emergence from the interaction of different systems (i.e. stakeholders) and spreads across systems, manifesting in different ways *(e.g. each member of a family is affected by an unhappy marriage in different ways)*.

Moreover, different stakeholders perceive the problem differently. The problem shifts according to who observes it *(e.g. each member of the family has a different perspective of why the marriage is unhappy).*

The problem changes in the course of time with every new interaction *(e.g. with every major fight the unhappy marriage could become more intractable).*

Thus a systemic problem is actually a field of interacting problems. Ackoff coined the term "mess" for a systemic problem, because of its messy nature.

Co-production

Systemic problems are co-produced by different systems. We refer to them as co-factors.

Co-factors are often problems themselves that are also co-produced by the same problems they give rise to (as explained in module 1 under circular causation). Thus, what is a problem and a co-factor depends on who looks at them and where one starts the analysis *(e.g. the financial problem of the family is a co-factor to the problem of the unhappy marriage and vice versa, depending if the marriage or the financial situation is investigated).* The reason for this is that any systemic problem, when explored in more detail, reveals itself as a "mess" of interacting problems.

Even strategies that represent a solution for one system can co-produce problems for another system. *For example, reducing school drop-outs in the education system increases the educated youth unemployment on the labour market, or success at work can impact on health or the family life.*

Multi-dimensionality

Systemic problems reflect all dimensions.

On the one hand, different stakeholders are associated with different dimensions *(e.g. a financier is associated with the economic dimension, an educationist with the cultural and a government department with the political dimension).*

On the other hand, each stakeholder could display all dimensions. *For example, the financial decision by a parent of which school to choose can be influenced by cultural (e.g. language, religion), economic (e.g. amount of money available to use neighbourhood or up-market school), political (e.g. ideological preference), ecological (e.g. geographic proximity), psychological (e.g. likes or dislikes) and / or physiological (e.g. health consideration) co-factors.*

Multi-level

Systemic problems span levels in the containing systems hierarchy – i.e. problems are co-produced by three levels, the self (and its sub-levels), systems in the outer levels and systems in the inner levels.

For example,

- problems in the **outer** environment in any dimension *(e.g. an economic crisis, a political or religious conflict, a natural disaster)* can make the education problem worse

- problems in the **inner** environment (e.g. disease and malnutrition, lack of motivation, trauma) can make the education problem worse.
- a badly conceptualised and / or run (part of the) education system *(e.g. wrong or outdated curricula, lack of resources, corruption)* creates more problems for the system it**self.**

Impact

Co-production also implies impact. Any action by a system can impact on the systems it interacts with, which need to respond to the change. They – in turn – impact on their interacting systems. Thus change keeps rippling through the system producing ever new outcomes of a synergistic or dis-synergistic nature for all interacting systems.

Current futures

Even if a system maintains its momentum and carries on with its current strategies, the outcome of its behaviour is unpredictable, because the environment will change. As the environment changes, the problems also shift.

For these reasons, a systemic problem cannot be analysed in the sense of identifying faulty parts. It can only be explored from different perspectives. In fact, there is no single identifiable problem, but a field of interacting problems that change depending on which stakeholder describes it and at what point in time.

For the same reasons, there cannot be any pre-given solution(s) to systemic problems. Different stakeholders want different – often contradictory – solutions.

To dissolve the problems by creating more desirable outcomes requires solutions that are acceptable to all stakeholders. This is the challenge of an ideal design, to meet apparently contradictory expectations. Only if stakeholders agree with the ideal design will they change their behaviour in accordance with it and co-produce the synergistic (win / win based) outcomes prescribed by the design which will dissolve the problem.

In systemic problems the logic of the problem is NOT the logic of the solution.

Solutions

Important co-factors of systemic problems are solutions in other systems. *For example, as pass rates in education increase, the youth unemployment gets worse. Or, payments for child support to alleviate poverty increases teenage pregnancy amongst the poor.*

Optimisation

If one system is optimised (i.e. creates benefits for itself) other systems can get sub-optimised. It leads to some systems benefitting at the expense of others. *For example, in module 1 we illustrated this with Ackoff's famous case study of the perfect parts that do not make up a perfect car.*

There are generic optimisation problems based on the distinction between activity and entity systems:

(Sub-)Optimising entity systems

In entity systems many problems arise from optimising the development of its different activity systems (i.e. functions) at the expense of the entity system as a whole. *A typical example in a person's life is to emphasise the work function at the expense of the family or personal health* *functions. A typical organisational example (which we explained in module 1) is optimising the marketing function (i.e. maximizing customization) and thereby sub-optimising operations (i.e. sub-optimising production) and vice versa.*

Also most change interventions in an organisation are directed at improving its functions rather than the organisation as a whole. This gives rise to problems such as *incoherent systems, duplications, internal competition, lack of coordination, repeating of mistakes in different parts, lack of learning, amongst others.*

This functional optimisation is also reinforced by traditional traditional MBA education which focuses on functional excellence.

The *Biomatrix Organisation Transformation Programme* is designed to balance the optimisation of the whole and its parts in a win / win manner. It is also a suitable education programme for complementing and completing an MBA education.

(Sub-)Optimising activity systems

As a function, an activity system is an inherent part of an entity system. Its development needs to maximize not its own development but that of the entity system which it co-produces (as explained in the previous point).

As a supply chain, an activity system consists of connecting sub-activity systems, whereby each sub-activity system belongs to a different entity system. *For example, the business activity systems of different energy generating organisations (e.g. coal and nuclear power stations, hydro-electric schemes, solar and wind parks) link up with the power transmission business and the power consumers (domestic and industrial users).*

If the different entity systems along the supply chain optimise the activity system belonging to them from their own perspective, the overarching supply chain will be sub-optimised. *For example, in the context of the energy supply chain the maximizing of efficiencies and profits of each energy generating business based on non-renewable energy sources, implies increasing sustainability related problems for the planet and its sub-systems, including humanity as a whole.*

The *Biomatrix Societal Transformation Programme* is designed to balance the optimisation of sub-activity systems along a supply chain with that of the supply chain as a whole in a win / win manner. It is also a necessary education programme for public policy designers.

The reason for problem analysis

Note: Because most problem situations contain both inherent and systemic problems, and because the term analysis is generally used when investigating problems, we continue to use the term problem analysis loosely to mean both conventional analysis and systemic exploration of problems.

Inherent problems

Inherent problems cannot be solved without an appropriate problem analysis. They require root cause analysis to identify where the problem originates from, so that it can be solved.

Analysis of a problem means looking into the system, locating the malfunctioning part and fixing it.

Systemic problems

Systemic problems can be dissolved without analysing them. One can make an ideal design without analysing and exploring the problem(s) that should be dissolved as a result of its implementation. *For example, one does not necessarily need to analyse an unhappy marriage or unproductive organisation in order to design a happy marriage or productive organisation.* This is indeed done in the "clean slate" ideal design approaches.

If systemic problems are analysed, it is not analysis in the conventional sense as there is no malfunctioning part that can be located. One can, however, explore and describe them in different ways.

We have found the exploration of systemic problems useful for the reasons that it

- gives a clue as to where to look for ideas of improvement (this is the basis of the later described "frogs into princes" brainstorming methodology) and how to transform the problem logic into a higher order solutions logic
- grounds a design in current reality, making the realists, who might otherwise reject it, more comfortable with the process of redesign
- allows stakeholders to be heard, providing psychological satisfaction
- creates an understanding of the complexity of a problem and that any systemic problem is actually an interacting system of problems and is circular in nature (as illustrated by a systems dynamics model)
- provides understanding concerning the magnitude and nature of the change that will be necessary
- is a basis for ongoing improvement and development of the system (i.e. one cannot improve a perfect system)
- points to problems that need to be solved and may have to be subjected to root cause analysis.

Why we call problems "frogs"

We call systemic problems and their problem co-factors "frogs".

This term is derived from the analogy of the "boiling frog" syndrome which shows that systemic problems get gradually worse in the course of time. It also illustrates that they are only noticed when the problem has become serious and even irreversible (i.e. the water in which the frog sits begins to boil and it cannot jump out anymore). The survival of the system is at stake.

The term "frog" is also a useful analogy in the context of transformation which is used in the brainstorming method of "turning frogs into princes". (See following section on *Brainstorming.*)

Overview of methodology

Root cause analysis

Root cause analysis is a body of knowledge that incorporates a variety of techniques aimed at identifying the root causes of a problem, *as for example decision trees, five whys, re-enactment methods and why-because*.

Since these techniques also involve the identification of problem co-factors, there are overlaps with the exploration of systemic problems as discussed below. It can indeed be useful to incorporate some of the root cause analysis techniques into a systemic exploration.

The main difference between root cause analysis and exploring systemic problems is probably one of purpose. The aim of root cause analysis is to eliminate the root cause of a problem in order to restore the system to a faultless functioning or improve its functioning. The aim of systemic exploration as we advocate it is used in the context of brainstorming ideas for transforming the system.

Systemic problem analysis / exploration

In order to get a more thorough understanding of the problematic nature of the system under investigation, it is useful to explore the system from a spatial and temporal perspective.

Spatial exploration

A spatial exploration looks at the current system and identifies its connectivity to other systems and their associated issues.

We have found the following steps of spatial exploration useful:

- identify as many problems in the current system as possible (one can also identify problems associated with past failures)
- identify the perceived co-factors of each problem (i.e. they are often derived from outside the system)
- identify stakeholders and problems / co-factors associated with them
- use frameworks for eliciting more aspects of problems (*e.g. multi-dimensionality*)
- determine some of the dynamics of the system by plotting the impacts between the problems and co-factors (this is useful to show the interrelated and systemic nature of the problems)
- use an a-rational problem illustration method (*e.g. creativity techniques, like drawing, role play or story telling*) in order to tap the individual and / or collective unconscious.

In the following module there will be more exploration of the current system based on the seven forces of system organisation.

Temporal exploration

A temporal exploration is concerned with describing the momentum inherent in the system and how it could drive the system to unfold in future. Trend analysis and scenario development are useful for this.

Trend analysis

Trends represent an extrapolation of the past into the future. They are derived from the assumption that the current momentum of the system continues. *For example, how many kilos will you weigh, if you keep piling them on at the same rate as in the past? What will the market share be like in 10 years time, if we keep growing / declining at the current rate? What will the population be in 2050, if humanity keeps growing at current rates?*

There are of course refinements to the forecasting game *(e.g. using alternative assumptions)*, but this is not the topic of this module.

Amongst others, the identification of trends is important to indicate

- growing deterioration in the system *(e.g. declining market share)* which indicates that change is necessary
- improvements in the system which could reflect a strengths of the system *(e.g. improved service),* or that strategies are working *(e.g. success of a new product)* or more favourable environmental conditions *(e.g. more favourable exchange rate, increased demand)*
- limits being reached *(e.g. depletion of groundwater due to increasing number of wells drilled for irrigation)*
- growing magnitude of a problem *(e.g. to build consideration of the growing population into designs for an ideal education or transport system)*

Current future scenarios

Scenarios are useful to cluster complex information, consider different types of emergence from intersecting trends to give alternative stories about the future. Current future scenarios give stories of how the situation could look if the system carries on doing what it is doing now. It is useful to distinguish between best and worst case scenarios.

Of course, there are other purposes for scenarios such as planning scenarios, which explore different strategic options, or the behaviour of different sections of the market, etc.

An ideal design can also be regarded as a scenario. It will be an ideal future scenario of your project.

Identifying problem solving opportunities

It is also useful to distinguish between the problems that can be solved by the (part of the) system which has the problem and those that cannot.

Problem solving opportunities can lead to the so called "quick wins" in a change intervention, as the system can proceed with problem solving immediately. If a problem is complex, more analysis may be needed through using root cause analysis.

By comparison, those problems that need to be dissolved require a transformation of the system and its stakeholders, before they will be seen to change. This can sometimes take a long time and it is useful to be aware of this from the start. It will also counter the "quick fix" mentality which is unfortunately so prevalent in management of organisations and society and is one of the main co-factors of unsuccessful change interventions.

Problems as opportunities

From a systemic perspective, it is good to identify as many "frogs" (i.e. problems and problem co-factors) as possible. The reason for this is that the more problems a system has, the greater is its potential for transformation.

Seeing that the system is problem riddled also raises awareness of the need for fundamental change and increases the motivation to change.

Additional reading

It is useful to read the following sections of *Biomatrix: A Systems Approach to Organisational and Societal Change* (3rd edition):

Identifying problem co-factors (pages 445 – 448)

Systemic management

When a major problem situation arises, change managers tend to be called in to facilitate its (dis)solving. To do so, they should know the distinction between problem solving and dissolving and use the appropriate methods in each context.

General managers will require mostly co-factor analysis to deal with most day to day problem solving and dissolving situations (*e.g. during operational planning meetings*).

Exercises

Exercise: Identify problems in the current system

This is a reproduction of the exercise from the section on *Emergence* in module 1. Review the exercise and edit, reformulate or add new problems.

Identify three to five of the biggest problems you have in your case study.

Notes:

- The more problems you find, the more ideas you will later generate for the design of your project.
- Be as specific as you can. Any person should be able to understand what you mean when reading each of your problems. *For example, "communication problem" is not acceptable. It does not explain the nature and reason of the problem (e.g. is there too little communication, an overload of it, wrong messages, delays, or what?). By comparison, a problem like "the boss does not provide strategic information that impacts on our work" is quite clear.*

Exercise: Identify problem co-factors

This is a reproduction of the exercise from the section on *Co-production* in module 1. Review the exercise and edit, reformulate and add new co-factors.

Exercise: Identify three to five co-factors for **each** of the problems identified in the previous section.

A co-factor is often a problem. It can also represent a success for the co-producing system. *For example, a co-producing factor of the educated youth unemployment problem is improvement in the pass rates of matriculants. Or, the more successful you are in completing a project, the bigger your workload might get.*

Notes:

- Do not use keywords but a sentence or part sentence for each problem co-factor.
- Be as specific as you can. Any person should be able to understand what you mean when reading each of your co-factors.

Exercise: Determine which problems need solving and which need dissolving

Review your list of problems and problem co-factors. Determine if they need solving or dissolving.

Select solving or dissolving from the orange drop-down menu next to your problems / co-factors.

If you are in doubt, the item probably needs dissolving (which often includes elements of problem solving).

Exercise: Identify past failures and their co-factors

Note: Persons as well as organisations often repeat the same mistakes without learning from them. This exercise is specifically designed to use past mistakes for brainstorming an ideal future.

Exercise: Identify one or two of the biggest failures associated with your case study (if not possible then in your life in general), either from personal experience or research.

Then identify the co-factors that gave rise to the failure.

You can increase the number of co-factors by using multi-dimensionality (i.e. by identifying psychological, cultural, economic, political, technological, ecological, physiological, biological and physical co-factors).

If any of the failures or failure co-factors are problems or problem co-factors that you have not considered previously, add them to your list of problems and problem co-factors.

Exercise: Model the dynamics of the problem / system

Note: This is a reproduction of the exercise from the section on *Impact* in module 1. Please skip it if you have already done it.

Exercise: Draw the mutual impacts between eight to ten of your problems and problem co-factors.

Use all your problems identified earlier and add a few problem co-factors to make up the eight to ten problems / co-factors. Arrange them in a circle and draw the impact between them.

Impact means that if one problem / co-factor changes, it will cause a change in another problem / co-factor. If there is a direct impact between two problems / co-factors, draw an arrow, with the tip towards the impacted on problem / co-factor.

We suggest that you only work with **direct strong** impacts. Because indirectly and weakly, everything impacts on everything else, (as illustrated by the famous "butterfly effect" from chaos theory: "If a butterfly flaps its wing, it co-causes a tornado") one would otherwise have to draw arrows between all co-factors, which is not very practical.

Work round robin:

- Start with problem / co-factors 1 and ask if it directly and strongly impacts on problem / co-factors 2. If yes, draw an arrow from 1 to 2. If no, don't draw an arrow. Then ask if it impacts on problem / co-factors 3, then 4 etc. till 10.
- Continue with problem / co-factor 2 and its impact on problem / co-factors 1, 3, 4, 5, etc., followed by problem / co-factor 3 and its impact on problem / co-factors 1, 2, 4, 5, etc. until you covered all.

This exercise yields a systems dynamics model of your problem.

You can either draw the image on a piece of paper, scan it and paste it into the space provided in the *Impacts* sheet in your assignment template, or you can use the drawing function in the sheet itself.

Exercise: Analyse trends

Note: Some co-factors (i.e. inherent properties) can be expressed quantitatively. Others can be described in qualitative terms or merely identified as getting worse or better.

Trends could indicate a growing problem *(e.g. increasing number of faults, customer complaints, days reported sick)* or success *(e.g. growing sales or profitability).*

Quantitative forecast

Look for important quantitative trends associated with your case study that indicate a deteriorating problem. Identify key quantitative data and project them into the future (you can only forecast as much forward as you have data in the history).

Qualitative forecast

Take one of your boiling frogs. Describe how it has changed over the last five years and how it would change over the next few years if the current momentum carries on.

Exercise: Explore current future scenarios

Considering all problems and co-factors, how could your situation develop over the next five to ten years? Describe two scenarios (stories), one as **the best case** (high road) and one as **the worst case** (low road).

Write one paragraph of three to four sentences for each scenario.

Exercise: Explore the current situation using a-rational methods

Note: A-rational methods often integrate complex information into a picture, analogy or metaphor. They also allow contributions from the subconscious to bubble up. Often these are indicators of hidden problem co-factors of which the system is not conscious.

One can also explore the current situation, current futures and the ideal future (i.e. ideal design) by using a-rational methods, like drawing, story- telling, acting, singing, sculpting or dancing, or using symbols, images, analogies, metaphors to depict or describe it.

Exercise: Draw an image of or give a symbol for the current situation of your case study.

We find drawing the current system as an animal a very useful and fun exercise. It works especially well if done in a team.

Alternatively, you could give an image or symbol that represents your current situation.

To generate an image, sit quietly, close your eyes, relax and do some deep breathing. Then ask your subconscious to send you an image representing the current situation. Wait until a thought or picture comes up. Take the first idea / image that comes up (do not reject it, or immediately try to "analyse" it). If you are not familiar with these types of methods, your relationship with your subconscious may be a bit "rusty" and it will take longer for the image to emerge (maybe during your next shower). Be patient.

When you receive the idea / image, draw it. Only after you have drawn it, write down the associations that come to your mind. Again, this is not an analysis, merely a noting of words and ideas that come to your mind.

Self-reflection

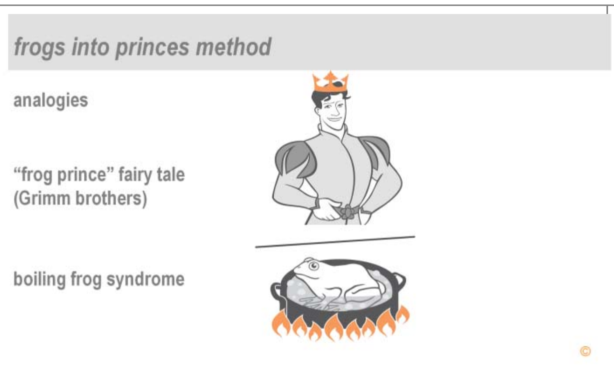
What were your insights about the theory and methods of problem analysis and how are they relevant to your case study?

Contextual reflection

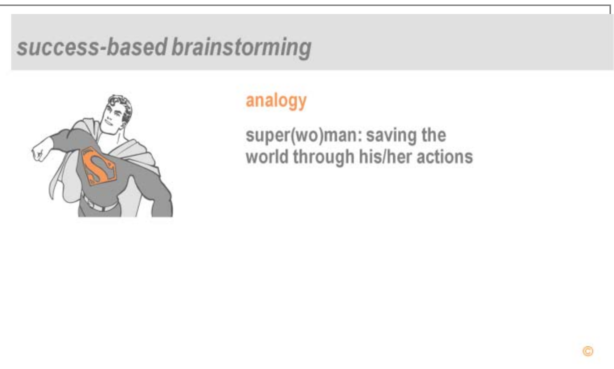
Comment on any issue (not necessarily related to your case study) that was recently reported in the media from the perspective of the theory and methods of problem analysis.

Step 3: Brainstorming

Visual summary



Problem-based brainstorming



Success-based brainstorming

Theoretical background

Problem dissolving requires a higher order logic

As explained previously, dissolving a systemic problem requires a different logic than solving a problem. This new logic is a higher order logic in the sense that it needs to bring about a new behaviour in all systems that co-produce the problem. It needs to dissolve all problems, not just a few, *analogous to creating health which dissolves all disease.*

This new logic is embedded in the ideal design. If the interacting systems are aligned around the design, they are inspired to behave in a manner that brings about the outcomes described in the design.

If the system does not have an ideal design, it cannot produce different outcomes. *For example, if one cannot conceive an ideal marriage, an ideal career, or an ideal organisation, one cannot behave differently to bring about a more desirable marriage, career or organisation.*

Systemic brainstorming assists in generating ideas for a design based on a new problem dissolving logic.

Overview of methodology

Brainstorming techniques

Any major problem dissolving situation should use a variety of brainstorming techniques. In our experience the following three types of techniques produce relevant ideas for an ideal design:

- problem-based brainstorming (used to transform the problems and weaknesses of the system)
- success-based brainstorming (used to build on the strengths of the system as well as the potential / excellence demonstrated by similar systems)

- a–rational methods (used to tap the right brain and sub-conscious mind for creative ideas and patterned integration of ideas for the ideal design).

The problem-based and a-rational brainstorming methods give rise to a new logic; while the success-based brainstorming reflects the desirable aspects of the current logic of system functioning. One does not want to lose those strengths in a new design. In fact, one wants to amplify them.

Problem-based brainstorming: Transforming “frogs” into “princes” method

Problem-based brainstorming involves transforming the identified problems and problem co-factors (or “frogs”) into ideals (or “princes”) and designing strategies for moving the system towards its “princes”.

The transformation of “frogs” into “princes” is derived from a fairytale (the *Frog Prince* by the Brothers Grimm), in which the princess (i.e. creativity, intuition) kisses (i.e. notices and accepts) the frog (i.e. problem). The kiss releases the prince (i.e. ideal) which was imprisoned in the frog by a spell.

This analogy of the fairytale illustrates the systemic nature of problem dissolving:

- the prince (who is a thinking and creative being) is a higher order phenomenon than the frog (which is an instinct and habit driven being)
- problems (frogs) are potentially creative; they have hidden within them the creative potential of improvement and transformation (a prince), which is the gift of the problem; (we keep emphasising that one cannot change a perfect system and that the more problems a system has, the more opportunities there are for its transformation)
- one needs to accept problems and not deny or ignore them, let alone fight them (by analogy, a dead frog does not release a prince, nor does one that has not been “kissed” (i.e. acknowledged, accepted and transformed).
- the method of replacing “frogs” (i.e. problems / co-factors) with “princes” (i.e. ideals) helps the mind to make the creative leap from being stuck in the problem to a higher order solution thinking.

Success-based brainstorming: Super(wo)man methods

Success-based brainstorming methods include the following:

- recalling past success experiences of the system itself, as well as successes of other systems (*e.g. role models, benchmarking, best practice*)
- identifying the success criteria that co-produce the success
- developing strategies on how to introduce those success criteria into the system.

We use “Super(wo)man” as the symbol for the success-based brainstorming method (for obvious reasons).

A-rational brainstorming methods

A-rational methods include methods such as making drawings, selecting symbols, making mood boards, story-telling, song-writing, using symbols and analogies, dancing, etc.

These methods tap into the creativity of the subconscious mind and its pattern recognition ability.

Additional reading

It is useful to read the following section of *Biomatrix: A Systems Approach to Organisational and Societal Change* (3rd edition):

Brainstorming technique: Turning “frogs” into “princes” (pages 448-455).

Systemic management

Change managers should be familiar with the three types of brainstorming methods and understand in which context and how to use them.

General managers will find the frogs / prince method useful to deal with problems that occur in day to day business, like those raised in the regular planning meetings. Any new problem encountered in the day to day operations of an organisation deserves brainstorming. Once skilled in it, it is quick to list the problem co-factors and then proceed to transform them into princes and strategies. These exercises tend to take much less time than the average problem discussion that characterises the typical planning meetings.

Exercises

Exercise: Transform your “frogs” into “princes”

Brainstorm ideals and strategies for each of your problems and problem co-factors following the procedure:

- Brainstorm at least one “prince” (ideal) for each problem and problem co-factor by asking the question: **What would I like to put as a “prince” (ideal) in the place of this “frog” (problem / co-factor)?**
- Design three or more strategies that will help you to move towards the ideal described by the “prince”. Ask: **How can the ideal be achieved (i.e. approximated)?**
- Proceed with this method for all your problems and problem co-factors.

Notes: The following are some useful tips on brainstorming ideals:

- Please note, we do not ask “How can I solve that problem?” but what ideally should **replace** it.
- By definition, an ideal is unattainable (or at best momentarily attainable, like the moment of happiness, which shifts in the next moment). Thus, if your ideal is attainable, it is not a “prince”. It is probably an objective or a goal.
- Be lofty and royal in your design of ideals. The loftier the ideal, the better strategies it will yield (see case studies in the Appendix, the section on *Brainstorming Technique*)
- Keep the “prince” as closely related to your frog as possible. For example, if your “frog” is “disease”, then the “prince” is “health” and not “happiness”.
- You are welcome to design more than one “prince” per “frog”. The more ideals you generate, the better your design will be.
- The most difficult part of any design exercise is to come up with powerful ideals. Once an ideal is formulated, designing strategies is relatively easy.

- Have fun with kissing your frogs into lofty and royal princes – after all, you are only brainstorming!

The following are some useful tips on designing strategies:

- The reason why you need more than one strategy (or course of action) is that everything in the universe is co-produced. Problems are co-produced and so are solutions and better outcomes for a system. Therefore, no single strategy will be sufficient for attaining any desired outcome.

- Strategies must be realistic (unlike the "prince" who should be ideal and hence unattainable). Realistic in this context means that the strategies must be do-able and within the current technological and organisational capability of the system, as well as its available resources. *For example, strategies based on unlimited or significantly extended resources (e.g. doubling of staff or budgets), as well as unrealistic strategies like "solving communication problems through telepathy" are not acceptable.*

- Design the strategies for an ideal as soon as you have written down the ideal. Do not generate all ideals for your problems / co-factors and then design the strategies. Rather, alternate between inserting an ideal and filling in the according strategies, before going to the next ideal and its associated strategies.

The following are some useful tips on the exercise and on brainstorming in general:

- The rules of brainstorming apply: Be creative; be prolific; abstain from judgment and have fun.

- Do not use key-words, but (half)sentences (anyone who was not in the brainstorming situation should be able to understand what the idea means).

- The ideas generated during brainstorming may or may not be used in the final design. It is more important to have more than fewer ideas. And sometimes seemingly "crazy" ideas indicate a higher order logic. Sometimes apparently "crazy" and "unrealistic" ideals get a new meaning at a later stage of the brainstorming or deliver a high level strategy that can be exported later to another context. *For example, the frog of "I have no time for learning" could give rise to the ideal "no time needed for learning" and strategies such as learning while doing other activities (e.g. during waiting times or while driving), divide learning between the team and develop the habit of ongoing learning through self-reflection during all activities.*

- You will find that many of your strategies and even some ideals will repeat themselves as you go on. However, unless they are exactly the same as previously (in which case copy and paste them in again) you will need to adjust the idea to the specific context. The apparently same type of strategy in a different context will be somewhat different. *For example, education and training are strategies that come up repeatedly. However, in the context of maintenance it is different than in the context of leadership. You do not want to lose the richness of detail.*

- Of course it seems quite a lot of work to design ideals and strategies for all the problems and co-factors you identified. However, your function deserves it, and so does your project. If systemic problem dissolving would be effortless, we would not have all those perplexing problems in organisations and society and – indeed – our personal lives.

- Also, after a while one becomes more skilled and faster as the exercise proceeds. (Try to compete with yourself in terms of speed and number of ideas.)

Exercise: Success experiences

Identify two of the most important success experiences in the history of your case study. (If you do not have a success experience relating your case study, use the biggest success experience you ever had in your life in whatever context it may have occurred).

Close your eyes and visualise the experience in as much detail as you can. Literally relive it in sensory rich detail (see, hear, smell, taste and touch the experience). Ask yourself:

- What did I do to make it a success?
- What did I feel at the time?
- Were there other people involved?
- How was the relationship with them?
- What resources (financial, material, knowledge, technological and human) did I have at my disposal and how did I use them?
- What were the environmental conditions like?

When you have explored the experience, write down the co-factors that contributed to the success.

Note: You can go into more detail by exploring the success from a multi-dimensional perspective and identify success co-factors associated with the psychological, cultural, economic, political, technological, ecological, physiological, biological and physical dimension.

Integrate your success co-factors with your ideals and strategies by reformulating them as any of the following:

- ideals (then design according strategies)
- strategies that can be added in the context of previously developed ideals
- new strategies that need to be added (and design a related ideal, then think up at least two more strategies for the new ideal).

Exercise: Role models

Identify at least one role model related to your case study. Identify the associated success co-factors. A role model could be a person, organisation, government, group, etc.

Integrate the success co-factors with your ideals and strategies as in the previous exercise.

Exercise: Best practice / benchmarking

Identify success co-factors associated with the best practice relating to your case study.

Integrate the success co-factors with your ideals and strategies as in the previous exercise.

Exercise: A-rational ideal

Make a drawing of the ideal design of your case study (pictures only, not words!) or find a symbol / metaphor to illustrate it.

Follow the same instructions as when drawing the current problem situation:

- We find drawing the ideal system as an animal a very useful and fun exercise. It works especially well if done in a team.
- Alternatively, you could give an image / symbol that represents your ideal case study.
- To generate an image, sit quietly, close your eyes, relax and do some deep breathing. Then ask your subconscious to send you a relevant idea / image. Wait until a picture comes up. Take the first image that comes up (do not reject it, or immediately try to “analyse” it). If you are not familiar with these types of methods, your relationship with your subconscious may be a bit “rusty” and it will take longer for the image to emerge (maybe during your next shower). Be patient.
- When you receive the image, draw it.
- After you have drawn the image, write down the associations that come to your mind. Again, this is not an analysis, merely a noting of words and ideas that come to your mind.

Self-reflection

What were your insights from the theory and application of problem-based, success-based and a-rational brainstorming and how are they relevant to your case study?

Contextual reflection

Comment on any issue (not necessarily related to your case study) that was recently reported in the media from the perspective of problem-based, success-based and a-rational brainstorming.

Step 4: Compile a design notebook

Compiling a design notebook is also part of the following module. In this module you will do only part of the exercises required for a design notebook.

Theoretical background

Co-production

The different co-factors that are identified during problem exploration arise from different co-producing systems. Likewise, the strategies that are designed during brainstorming need to be enacted by different stakeholders (i.e. systems and sub-systems).

The “ownership” issue is not of major relevance in making an ideal design, because the design transcends and incorporates the interests of the different co-producing systems. However, in designing strategies that co-produce the ideal design ownership is of importance. Each stakeholder must make a unique and function specific contribution to bringing about the outcomes inspired by the ideal design.

It is therefore necessary to cluster the data outputs in such a way that they are useful for both creating an overarching ideal design and developing stakeholder specific strategies.

In the context of the *Biomatrix Organisation Transformation Programme,* problems are identified throughout the organisation (by means of a survey) and brainstorming ideas elicited. This information is redistributed to those parts of the system from which a specific problem co-factor originates and who can deal with a specific strategy. Information produced during the *Biomatrix Societal Transformation Programme* is processed likewise.

Thus the purpose of the design notebook is to integrate brainstorming output, eliminate duplications (by now you will have realised that the same kind of ideas come up in a different context), deal with overlaps and classify ideas under appropriate headings. The larger the issue or system of redesign, the more brainstorming output will be generated and the more important the design notebook becomes.

Iteration

The compilation of a design notebook serves not only the re-clustering and integration of information, but it also facilitates the first round of thinking about the design. It allows the sub-conscious mind to interact with the information in order to later deliver the creative ideas that comprise an ideal system (re)design.

Any good design involves iterating through the ideas one has already assembled, adding to them, changing and reframing them.

Overview of methodology

Compiling a design notebook involves

- allocating ownership to the data (i.e. the problems and / or the strategies)

- clustering the information according to the framework for the ideal design (in module 3 you will cluster your information according to the seven forces of system organisation which will be the design framework for your case study.)

In reorganising the ideas into a design notebook, they are not judged for their merit or eliminated yet, other than eliminating obvious duplications. Thus the design notebook reflects all ideas generated during brainstorming. It is a brainstorming document.

Systemic management

Change managers who facilitate brainstorming workshops need to be familiar with the systemic redistribution and integration of brainstorming output.

Additional reading

It is useful to read the following sections of *Biomatrix: A Systems Approach to Organisational and Societal Change* (3rd edition):

Compiling a design notebook (page 456)

Exercise

Exercise: Categorise your brainstorming output according to ownership

Read through each of the strategies you have brainstormed and determine who should "own" the proposed strategy.

Select from the drop down menu in your Google sheet one of the following:

- I personally
- internal stakeholders (name which)
- external stakeholders (name which).

Self-reflection

What were your insights about the concept of the design notebook and how are they relevant to your case study?

Contextual reflection

Can you think of the relevance of a design notebook in general?

Introduction to step 5: Create an ideal design

Creating an ideal design is part of the following module. In this module we will only provide a brief overview and an introductory exercise.

Theoretical background

A design is an idealized description of the ideal future state of the system. It describes the nature of the system and its outcomes in idealized form. It will also contain core strategies by which the system wants to bring about this state (i.e. means or activities).

However, a list of objectives and strategies is not a design. A design is a viable whole. There must be integrity of the whole. The design must inspire!

An ideal design is part of the conceptual reality of a system. It in-forms (i.e. puts form into) the physical reality of the system. If a system would choose a different ideal design, its physical reality would unfold in a different way. It would become a different system. Thus it is important which ideal a system chooses to manifest.

Overview of methodology

The designer (or design team) uses the information contained in the *Design Notebook*, an appropriate design framework as well as the generic principles of organisation prescribed by *Biomatrix Systems Theory* to create an ideal design for the system.

Although the framework and principles are given, their application to the actual content of the design is not and requires the creativity of the designer(s).

In psycho-social systems as well as technological systems the design is more of an art than a science.

In the case of natural systems, the designers have to consider the laws of nature that represent the (relatively) fixed functioning of nature's systems. These act as constraints to the design. The designer needs to be an expert.

Additional reading

It is useful to read the following sections of *Biomatrix: A Systems Approach to Organisational and Societal Change* (3rd edition):

Integrating the brainstorming output into a design (pages 456-459)

Exercise

Introductory exercise: Create a draft ideal design

Note: The design framework that will be used for the ideal design of your case study will be the subject of module 3.

In the meantime, we suggest that you do a first iteration of an ideal redesign of your case study.

Exercise: Describe your case study according to the following:

- clients that your case study serves
- their expectations
- the ideal outcomes you want to achieve for them
- the strategies you will employ to achieve the ideal state and outcome(s) of your case study
- the criteria for measuring the achievement of outcomes.

Self-reflection

What were your insights about making a draft ideal design and how are they relevant to your case study?

Contextual reflection

What is the relevance of ideal system (re)design for society in general?

Introduction to step 6: Make an implementation plan

Making an implementation plan is part of module 4. In this module we will only provide a brief overview and introductory exercise.

Theoretical background

Implementation planning for solving and dissolving problems

A design cannot be implemented. It first needs an implementation plan that describes how the change can be brought about.

This is true for implementing a relatively simple design *(e.g. renovation or building of your house)* as well as a more complex one *(e.g. transforming an organisation or the global financial system).*

Both problem solving and problem dissolving situations require an implementation plan.

Problem solving

In a problem solving situation, the implementation plan describes the steps that need to be taken to recreate the system according to the original design.

In relatively simple problem solving situations, the steps can be almost common-sensical and follow product prescriptions (*e.g. to glue my broken vase I need to buy the right glue, read the instructions and apply them, like spreading glue on each part, pressing them together and holding them till the glue is set*).

To maintain or repair an aircraft is obviously more involved. Nevertheless, it also follows action steps prescribed by maintenance manuals and problem solving procedures that restore it to its original functioning.

Typically, such actions associated with problem solving can be taken immediately according to prescribed procedures.

Problem dissolving

In a problem dissolving situation the stakeholders have to be aligned around the design before an implementation plan is made.

Then they need to be involved in an overarching and coordinated implementation plan, before each stakeholder can make a more detailed implementation plan that is relevant to his share of co-producing the ideal design.

There will also be iteration between the overarching plan and the detailed stakeholder relevant plans.

Overview of methodology

An implementation plan describes the

- steps (and sub-steps) involved in implementing the design
- estimated length of time that each step (and sub-step) takes

- resources that are required for each step (and sub-step), such as human, material, technological, financial and knowledge resources
- agent (*e.g. person, department, organisation*) that is responsible for implementing each step (and sub-step)
- governance associated with each step (and sub-step), such as evaluation criteria, procedures and responsible governance agent(s).

Additional reading

It is useful to read the following sections of *Biomatrix: A Systems Approach to Organisational and Societal Change* (3rd edition):

Making an implementation plan (pages 459-461)

Exercises

Introductory exercise: Next action steps

While implementation planning and the implementation of plans will have to wait until your ideal design is complete, you can nevertheless take some actions now.

These actions will be related to problem solving rather than transforming your system fundamentally.

They could also relate to change management steps, *as for example what you need to do next to align stakeholders and get their input to your design.*

Review the strategies associated with problems which you marked as solving.

- design the 5 to 10 most important action steps you can take immediately to solve the problems
- establish timeframes by which to complete the step
- estimate how long it will take to solve the whole problem (you may have to determine the broad action steps involved and estimate the time it could take to complete each)

Self-reflection

What were your insights about making an implementation plan and how are they relevant to your case study?

Contextual reflection

Can you think of a recent change intervention in your environment or society which failed or succeeded due to implementation planning?

Introduction to step 7: Implement the design

Implementation of your design is discussed in module 4. In this module we will provide only a brief overview and introductory exercise.

Theoretical background

Implementation of the design occurs according to the planned action steps.

Overview of methodology

The planned action steps are integrated with the existing strategic and operational plans of the system and then implemented in the context of the day to day performance of the system.

Until the implementation of the design starts, it is “business as usual”.

Exercise

Introductory exercise: Implement the next action steps

This is not an exercise anymore, but the real thing.

Just do it.....

Self-reflection

What were your insights about implementing the next action steps and how are they relevant to your case study?

Contextual reflection

Can you think of a recent issue in your environment or society which failed or succeeded due to the way it was implemented?

Module summary

In summary, the module dealt with the following information:

Theoretical background

Current versus ideal future

Any system (or issue) arrived at its current state (or situation) as a result of past developments and decisions. Unless deliberate changes are made, it moves into a current future. There will be a range of possible current futures depending on changes in the environment.

One can design an ideal future for the system (or issue) and plan strategies on how to achieve it. Although an ideal state can never be fully or permanently attained, it can nevertheless be approximated.

Problem solving versus dissolving

Solving a problem returns the system towards its original state before the problem occurred. It moves the system into a current future. This is only possible with inherent problems (i.e. faults in the system). The problem is solved according to the logic of the current system design.

To dissolve a problem implies designing a new state for the system and moving it towards it. In the course of approximating the new state, the problem gets dissolved. The system is transformed. Problem dissolving is required for systemic problems (i.e. problems that arise from interaction). An ideal design represents a new logic of system functioning.

Steps in ideal system (re)design

A clearly defined problem that can be solved has a prescribed procedure on how to solve it.

Systemic (emergent or “messy” problems) need to be dissolved through ideal system redesign. This implies that the systems associated with the problem need to change their behaviour– i.e. the interaction between the systems and often the systems themselves need to be transformed.

The Biomatrix Ideal System (Re)Design Methodology is derived from *Biomatrix Systems Theory,* but also incorporates tools and methods developed by other systems thinkers.

It consists of the following steps:

1. Choose a framework for analysis and design

Different types of systems require different frameworks for (dis)solving their problems

2. Analyse problems in the current system

It is important to explore and diagnose the problems in a system before determining an intervention

3. Brainstorm ideals and strategies

Creating an ideal system design that represents a new logic and inspires a transformation of the system requires creativity. Brainstorming assists in this and generates new ideas that allow the system to transform / reinvent itself.

We suggest using problem as well as success based brainstorming methods, stakeholder-based brainstorming and a-rational brainstorming techniques.

4. Compile a design notebook

Brainstorming creates a large amount of ideas, as well as ideas “belonging” to different interacting systems. A design notebook assists in the integration, categorization and redistribution of ideas in preparation for an ideal design.

5. Introduction: Create an ideal design

An ideal design is made based on an appropriate design framework, using the brainstormed ideas from the design notebook as well as generic principles of system organisation. It describes the desired ideal state of the system and the strategies with which to achieve it.

6. Introduction: Make an implementation plan

A design is not an implementation plan. Only after an implementation plan has been made can one evaluate if the design is feasible and the system has the resources and abilities to transform itself according to the ideal design.

7. Introduction: Implement the design

The ideal design is implemented according to the steps determined in the implementation plan.

Self-reflection on the module

Self-reflection on theory

Identify the three most important things you learned and describe why they are important to your case study.

Self-reflection on application

How does what you learned affect your case study?

Next modules

In module 3 on *Ideal Activity System Design* you will learn about *Seven Forces of System Organisation* and how they can be applied to creating an ideal design for your project / function.

You will also make an implementation plan for your design.