

WICKED WORLD

**Complex Challenges and
Systems Innovation**

**Karel van Berkel
Anu Manickam**

**Noordhoff
Business**

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Systems Innovation**

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International Edition

**Karel van Berkel
Anu Manickam**

**Noordhoff
Groningen/Utrecht**

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Preface

We live in an era where almost everything is being transformed into something new. Everything is up for discussion. Power relationships are changing in many areas of our lives and in many places – no one knows whether we are moving in the right direction. Similarly, the downside of globalization has become starkly visible in recent times with climate change and the emergence of COVID-19. Our vulnerability has been exposed. We have been hit hard and we need to adapt fast – not only to issues related to our health, but also to how we organize ourselves in economic and social domains.

Since the beginning of our collaborations, our partnership has been repeatedly challenged by complex issues. We share a passion for (almost) insoluble problems and have been on a journey that has brought us to appreciate the need for systems approaches when addressing personal, organizational and social challenges. Our focus on exploring ‘problems behind the problem’ has resulted in a deeper understanding of systems dynamics.

This book is about complex problems that do not respond to conventional approaches. We share our insights and the resulting sensemaking framework for systems innovations in *wicked worlds*.

We would like to thank everyone who has crossed our paths in the past thirty years: clients, teams and individuals we have worked with, our students from Master programmes who investigated complex problems using this approach and helped validate its emergence over the years. Their examples, questions and collaborative thinking made this book on complexity and systems innovations possible.

In particular, we wish to thank our publisher Petra Prescher for her confidence and support in realizing our book, which aims to make complex systems sciences accessible to current and future professionals in policy and organizational management and support them in dealing with the unprecedented challenges of a Wicked World. In addition, we thank Ada Bolhuis and Manimohan Manickam for their help in realizing a well-edited book. To Ans Assies from Hanze University we are grateful for catapulting the international edition into print earlier than planned. We also would like to thank reviewers and readers of our Dutch edition for their acknowledgements and validation of the book's impact on their work.

Most importantly, we would like to express our thanks to our families for their enthusiastic and continued support. They have been a source of immense inspiration for us.

Anu Manickam and Karel van Berkel
June 2020

Introduction

Simple or complex? We prefer life to be simple and ideally, we like to avoid complex issues. When there is no way around such issues, we break them down into smaller, more manageable parts, we look for unambiguous causes that can be eliminated and seek simple solutions.

This compulsion to simplify complex challenges, *wicked problems* as they are also referred to, is ineffective when confronting them. In a complex world, change does not unfold smoothly, according to our needs, calculations and plans. Then, there are also coincidences and crises shaping developments.

Current approaches to problem-solving and traditional methods of facilitating change will only take us so far. No magic formula exists to prevent an economic or health crisis, cope with the flow of migrants or combat global warming. In fact, despite all the progress we have made, we find ourselves caught in an irrevocably tangled web of interrelated problems that we try to solve through simplification.

The only way for us to bring such *wicked problems* to heel is to accept their complexity and acknowledge that there are no easy solutions. *Wicked problems* call for a different approach. Systems and complexity theories provide insights to understand and unravel complex and dynamic *wicked problems*.

Taking a systemic view yields new possibilities for interventions. It offers a new paradigm for policy, strategic action, change, planning, organizing, leadership and cooperation. Systemic interventions are applicable to

persistent challenges facing individuals, families, teams, organizations, networks, countries, but also, other living systems.

Systems innovation gives us tools to more effectively handle complex issues. Understanding and dealing with divided and vested interests, mapping developments and connecting the dots, changing the playing field, simplifying rules of the game, are glimpses of this approach.

This book puts forward a coherent and systemic approach to problems in a Wicked World. It offers practical examples to convey this new way of thinking and to begin applying it in organizations or policymaking.

By openly embracing the complicated and intractable nature of complex problems, we can better understand why things happen the way they do and create new solutions.

1

**Wicked
world**

How do we view our world? There are three dominant lenses. The first is one of 'control' in which we assume that everything can be planned. The second is what we call the 'bubble world'. In this worldview, opinions and biases are dominant and group-driven. The third is the 'complex' world where we accept the paradoxical, unpredictable and dynamic nature of things due to interconnectedness.

Three worldviews

The worldview of a person determines how they look at problems and what actions they take to achieve their desired results. The three worldviews therefore impact assumptions, behaviours and results of the respective groups embracing them.

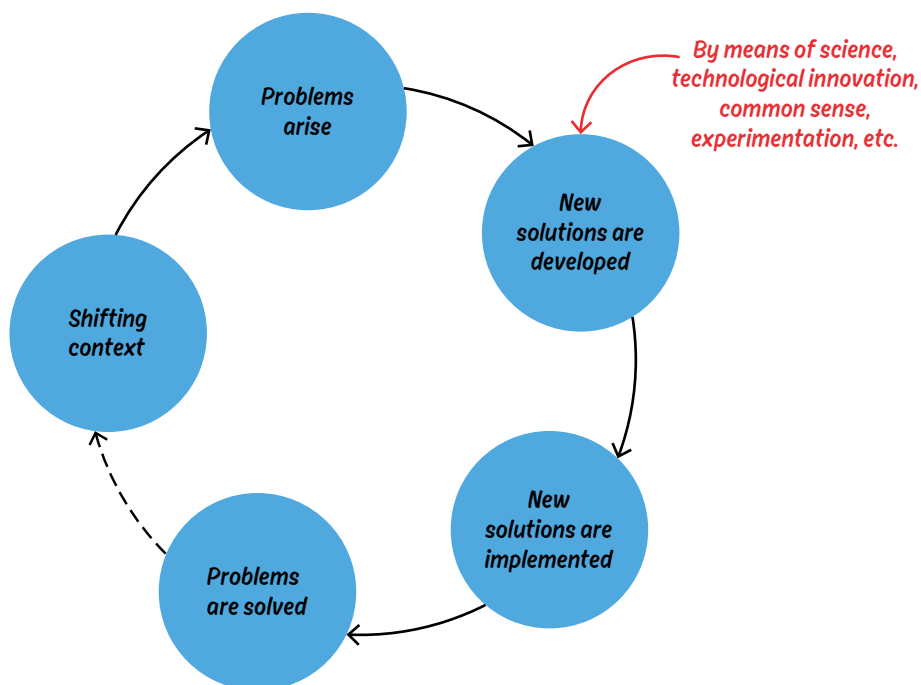
The controllable world

We can, to a certain extent, succeed in making our world manageable, familiar and reliable. We have achieved this through planning, calculating, experimenting, replicating, learning and designing. We can plan certain aspects of our lives: we can pave roads and build bridges, heat our homes and cure many diseases. Facts, laws, routines, rules of thumb, evidence of effectiveness, habits and regulations help us to lead our lives without undue confusion. When a problem arises or something happens to thwart our plans, we diligently search for a quick solution. We have faith in specialists and their methods. For a moment, our world seems manageable once more. At least until something else happens.

The manageable world is only one part of our reality. Many problems that seem manageable in the short term may prove to be more complex in the long term or when seen in a broader context. Fossil fuels were once considered an outstanding resource for heating, mobility and industrial use until we realized that the Earth was warming-up and climate change was becoming a *wicked problem*.

6 The controllable world is only one part of the real world

Brexit, United Kingdom's withdrawal from the European Union, was an appealing and obvious decision for many (in the UK) and it seemed a manageable option. This changed as problems emerged. These included negotiations on the scope and duration of a transition, the financial obligations and risks to both the UK and Europe, post Brexit EU and UK citizens' rights, challenges of a border between the Republic of Ireland and Northern Ireland, expectations and disappointments regarding a new trade deal with the EU, common challenges and shared resources such as military and policing agreements, anti-terrorism, space and education programmes and human trafficking.



The examples show that often actions we take may have unforeseen consequences, thus resulting in new problems. We are not always in control.

The bubble world

For many in the Western world, life has become less predictable and less safe. We worry about our incomes as robots and automation increasingly replace jobs. Some worry about our prosperity and the economy as newly developed countries are catching up and may overtake us. Will we be able to master our fears of cybercrime and terrorism?

A study by Shepherd and Kay (2012) shows that people tend to avoid societal issues they find too difficult. This effect is heightened when the issue at hand is serious and urgent. The inclination is to defend the status quo rather than pursue information and embrace change.

In her book *Political Tribes* (2018), Amy Chua describes how groups who feel threatened often retreat into ethnic or cultural tribalism. They isolate themselves, close ranks, begin to think in terms of 'us and them'. They feel they are being attacked, bullied and discriminated and often react defensively. Chua explains how capitalist market-based thinking has led to a growing divide between a small, wealthy elite and the rest of the population. Individuals demand what is rightfully theirs based on their tribal standing. Another phenomenon of *political tribes* is that new tribes are emerging. An example of this is the growing diversity in sexuality and self-identification, represented by the acronym LGBTQQIP2SAA (lesbian, gay, bisexual, transgender, queer, questioning, intersex, pansexual, two-spirited, asexual, allies). Amy Chua explains that similar tribal circles are emerging in many places around the world.

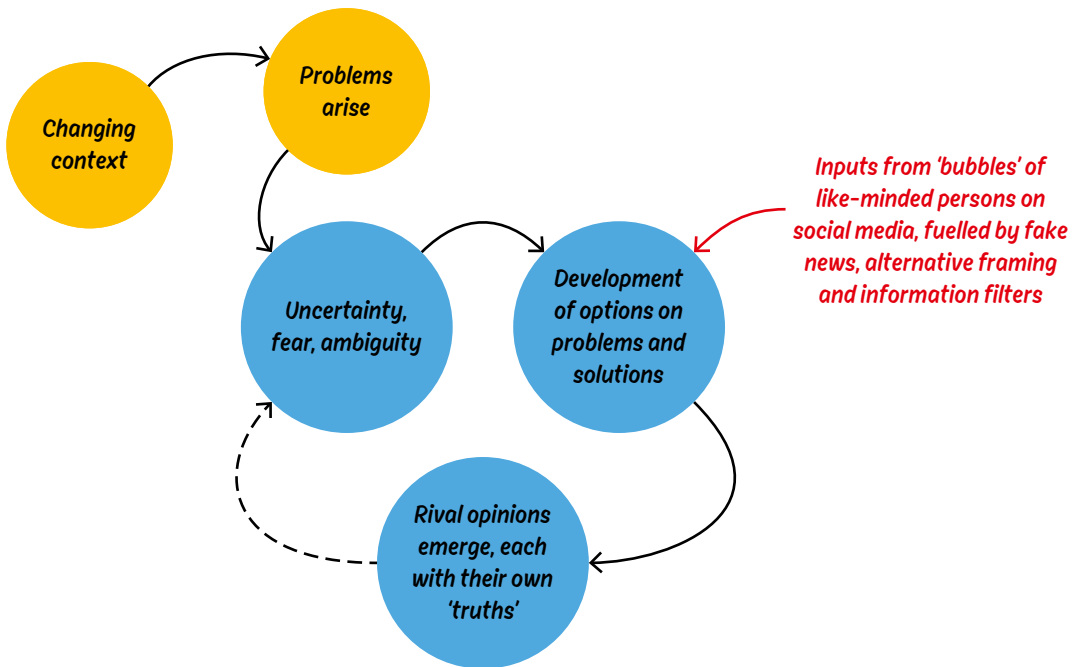
A new development, in an effort to cope with uncertainties, is the large number of people seeking support from digital networks.¹ They look for support from like-minded individuals and use social media to develop and reinforce their opinions, behaviour and identity. This results in homogeneous 'bubbles' in which Twitter and other social media is used to (re)interpret facts² and check opinions with others who share similar beliefs. These groups or *bubbles* may be scattered all over the world, but they share similar opinions, fears and anxieties. These developments have seen politicians and corporations cashing in to serve their interests whilst individuals in these *bubbles* also profit from visibility and popularity.

Bubble worlds are sensitive to populism, manipulation and fake news as 'popular' views are spread via websites and social media (Bruce, 2017). Big data technologies and personal profiling enhance the impact of widespread views and altered news. Often used in politics, this trend is called 'post-truth-politics'.³ Political framing, conveying a message through words and imagery to appeal to a certain group, is a way of simplifying reality.

Professor of Public Administration Hans de Bruijn distinguishes between frames that resemble a project and those that resemble drama. A project frame is exploited by those who want to 'project' authority. They do this by asserting their version of a problem, its causes and often simplified

solutions (De Bruijn, 2016). This simplification makes a complex reality more manageable: 'When the sea level rises, we need to build higher dykes.' In contrast, a drama frame, focusses on the players instead of the core issue. There are villains, heroes and victims in a drama. The drama frame plays on emotions: 'Immigrants are thieving opportunists who cause trouble for normal citizens, which is why we should send them back.'

Web-algorithms fuel the *bubble world* by social profiling. This helps political and commercial parties to bring specific information to specific target groups. This is known as micro-targeting. Your 'click behaviour', location, spending patterns, friends and search history are used to ensure that you land in a specific information *bubble* and this means that you are less exposed to deviating facts and opinions. By *living in bubbles*, our perspectives and biases are confirmed (Pariser, 2011).

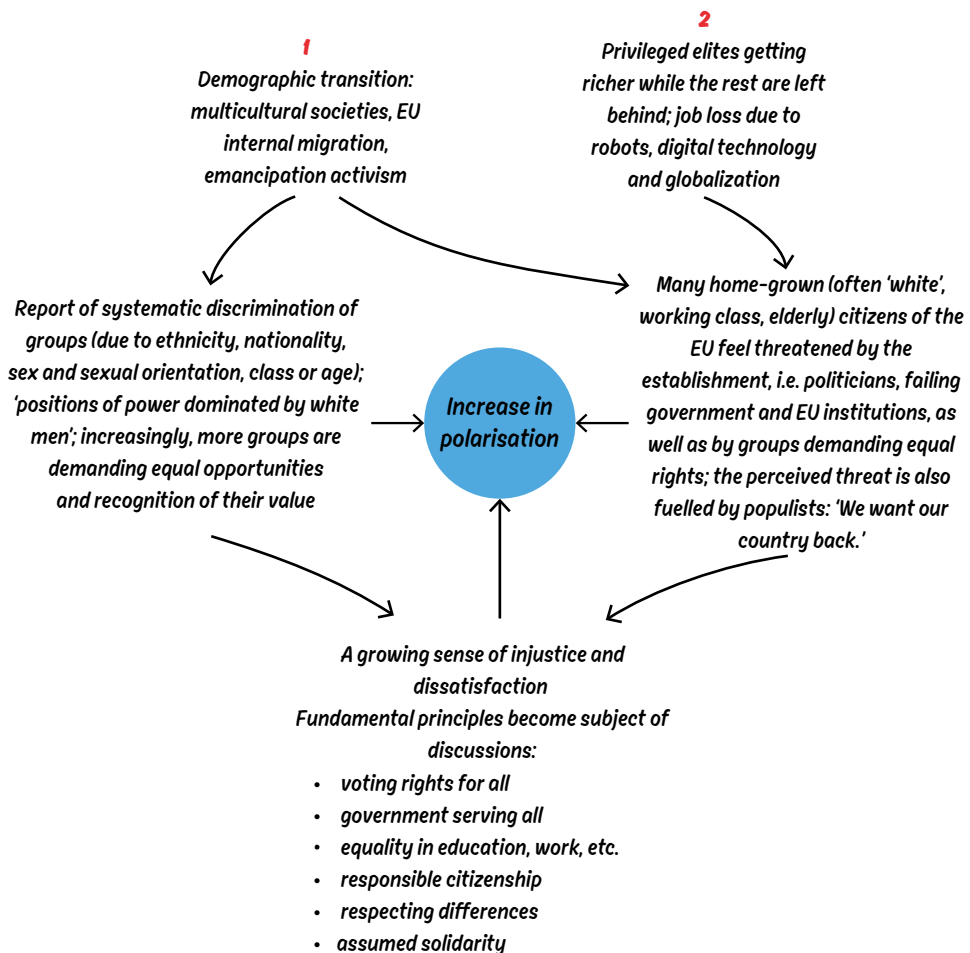


People feel comfortable in their *bubble worlds* as their view of the world and opinions are reinforced and thus begin to feel less threatened. The trend towards *bubbles* promotes self-opinionated and opposing views that results in antagonism against those who have dissimilar outlooks: rich versus poor, urban versus rural, young versus old, women versus men, and so on. Such behaviours entail grave risks. These *bubbles* resemble what Janis describes as 'groupthink',⁴ which leads to collective rationalisation

of behaviour, stereotyping of others and often enforced conformity. When we conform, there is no longer any fact-checking or comparing points of view with someone whose ideology differs from our own (Van den Bos, 2017).

The European Commission is conscious of these risks paired with the increasingly polarizing effect of *bubble worlds*. A panel of experts were asked to provide recommendations to combat disinformation. Their report recommended a code of conduct for those responsible for hosting or distributing information on the Internet. This would apply to online platforms, news media and fact-checking organizations. While ensuring room for freedom of expression, transparency and clarity of views need to be safeguarded. The report also recommends investing in media literacy of citizens, cybersecurity and quality of journalism (European Union, 2018).

6 In a complex world, like-minded individuals seek support in their bubbles



The complex world

The world we live in has become complex, characterized as being VUCA: volatile, uncertain, complex and ambiguous. The waves of crises that have daunted us in recent times bear witness to this: the financial crisis of 2008 coupled with the Euro-crisis; Brexit in 2019 and currently the COVID-19 pandemic of 2020. Each crisis uncovers deeply rooted weakness and structural deficiencies. It confronts us with our inability to be in control.

Wicked problems

Horst Rittel and Melvin Webber (1973) recognized that not all problems are the same. Simple problems can be easily defined and divided into manageable parts, which can then be solved. For more complicated problems, professionals or experts may be needed but these can still be solved. They referred to these types of problems as *tame problems*. Examples of *tame problems* are fixing a bicycle, kidney transplants and sending a rocket to the moon.



Wicked problems defy simple solutions

The second type of problems identified by Rittel and Webber often prove to be more elusive and defy simple solutions and these are referred to as *wicked problems*. Part of what makes them complex is that different stakeholders define the problem differently, each with their own perceptions of what is important and what needs to be done. Simplifying these problems often make them worse.

Wicked problems are problems:

- that can be defined in more than one way;
- that cannot be broken down into smaller problems;
- that involve multiple parties and multiple interests;
- that invoke different solutions from different parties;
- that trigger a new problem for every solution;
- that develop in unpredictable ways.

Wicked problems defy a simple explanation. We can illustrate this with the case of natural gas extraction in Groningen, the Netherlands. Gas extraction was embraced as a reliable, long-term solution for its energy supply. This euphoria was intact up to 1986 when the first earthquake in the region took place. Since that time, more than one thousand

tremors followed and were tolerated. However, the turning point came in 2012 with an earthquake that caused visible and significant damage. Gas extraction was a major contributor to the treasury and the lobby of the NAM, the oil and gas company, was substantial. However, Dutch politicians and NAM, could not ignore protests and the hazards of gas extraction for the inhabitants.

Technical solutions were initially proposed to appease inhabitants and service victims but these were inadequate due to the nature of what was at play. These included different needs, differences in *sense of urgency*, bureaucracy, power differences, social and cultural costs next to economic costs, significance of gas in facilitating energy transition, concerns about energy supply and affordability, fears regarding health and safety, which in turn led to increased distrust, social unrest, inadequate communication, new coalitions, etc. The rest of the country was sympathetic but also wary of the money flowing away from them.



Wicked problems are interconnected with other key challenges. Gas extraction is linked to energy transition, which is related directly to climate change. This makes the problem of gas not only an economic but also an environmental issue. The earthquakes not only resulted in material damage but also caused emotional and psychological impacts.

We know that *wicked problems* are framed differently by different stakeholders with very different solutions. In the illustration, we see how the government, NAM, residents in the area, citizens elsewhere and the construction industry responded.

We also know that solutions for a *wicked problem* often creates new problems or aggravates existing ones. When the government ordered drilling to be stopped at Loppersum, where extensive damage had taken place, the earthquakes increased further south. Halting gas extraction also meant that long-term gas contracts needed to be revised at additional costs. This meant a double loss of revenue. Also, alternative energy supplies meant additional costs for all as home-grown gas was cheaper.

Finally, *wicked problems* are unpredictable. It was unclear what the end game of 'no gas' from Groningen fields would bring and how to resolve the many problems connected to it. But as is often the case with *wicked problems*, underlying patterns become more visible, which provide guidance for where potential solutions can be found. For Groningen, uncertainty about earthquakes remain even after drilling ceases. It was clear that the way forward included wind turbines, solar panels, sustainable construction, gas-free homes, electric cars, heat pumps, etc.

When faced with complex problems, we may not know how to tackle them, but we know that something must be done, and that things need to be changed radically.

We live in a *wicked world* of complex problems. Below, a handful of examples from an ever-growing list:

Influx of refugees and reactions from host populations	Urban migration and depopulation of rural areas	Shifting geopolitical relationships with new global powers
Role of Internet and social media	Energy transition	Threat of terrorism
Impact of Uber, Airbnb and online platforms	Financial/economic crises and recoveries	Plastics in our oceans

Loss of jobs and robotization	Virus pandemics	Outbreaks of livestock disease
Greying society	Regional development	Drug-related crime
Trump's America	Internet of Things	The future of Europe
Obesity	Genetic modification	Influx of asylum-seekers

Super wicked problems

There is another category of problems that are even more complex, the *super wicked problems*, which for example, capture the essence of global warming (Levin et al., 2012). *Super wicked problems* have a larger and more pervasive scope and *sense of urgency* about them. The most recent example is that of COVID-19, although the jury is still out on whether it is a *wicked* or *super wicked problem*.

Super wicked problems are defined by four characteristics:

- Time is running out.
- Solutions are offered by those responsible for the problem.
- No central authority has legitimacy to solve the problem.
- Problem-solving is postponed with irrational assumptions about the future.

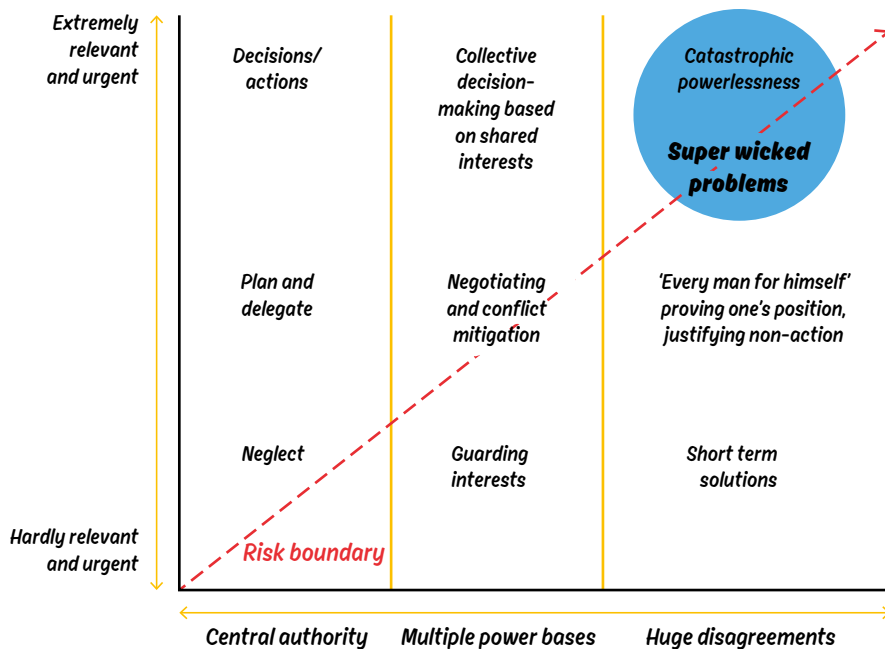
Climate change illustrates features of a *super wicked problem*. The *sense of urgency* before global catastrophe strikes is captured by the 'minutes to midnight' metaphor. Many professionals are convinced of the need for action to mitigate climate change but rampant disagreements abound on how much time, and how to attack the issues. The clock ticks as discussions continue, increasing risks and urgency.

We all contribute to global warming. Even as we take small steps in the name of climate change, we continue to exacerbate global warming through our behaviour and daily habits – how we eat, drink and travel. Similarly, politicians will endure the use of fossil fuels even when promoting renewable energy.

Climate change does not have a single authority that calls the shots. Current power houses are divided: some deny the problem, Trump being an example; others, developing countries in particular, demand the burden

be borne by wealthier nations even as they push for greater economic and social prosperity; and there are others who wait, convinced that only a concerted effort will help. These responses also reflect our tendency to ignore the present and assume, or hope, that it will work out in the future.

The misplaced assumption by politicians and policymakers dealing with immediate goals and short-term solutions to appease the electorate when dealing with urgent problems often comes at a high price. It may be too late but often, as in the case of climate change, youth and citizens take to the streets to challenge authorities who do not respond adequately.



The illustration reflects how we react to problems and where the dividing line is that could lead us towards risks and catastrophe. The onus is on us to recognize *super wicked problems* and the need for timely response.

Context determines the approach

David Snowden and Mary Boone (2007) designed the *Cynefin framework*, which distinguishes four different contexts of decision-making: simple, complicated, complex and chaotic problems.

Simple problems are stable and display clear relationships between cause and effect. If we are in traffic and the light turns red, we know what

is happening and how to react. If the situation is clear to us, the solution is usually within our reach. *Best practices* are usually available to solve simple problems.

Complicated problems are more intricate and often best left to experts. We may recognize that there is a problem, but multiple solutions may be possible, which is why we need experts to investigate and choose appropriate solutions. Complicated problems include sending a rocket to the moon, which requires extremely precise calculations and protocols. Each component needs to be tested and perfectly assembled. In the process, experts learn continuously and develop blueprints for improving such processes. *Good practices* are often available for solving complicated problems.

As far as **complex problems** are concerned, there are no 'right' answers: the context is intricate and continuously



Complex problems have no 'right' answers

changing. The future is difficult to predict and decisions or solutions usually affect other related aspects. Developments in the European Union are a good example of this. Every decision at every political level, both within Europe and beyond, causes the context to change entirely. With Brexit, decisions of the British people have impacted not only internal affairs such as the borders on the Irish island for example, but has in fact dampened the demand to leave the EU by some groups in other EU nations. Managers also deal with complex situations in which forecasts and proposed decisions can become irrelevant before implementation. For example, a major client decides to take their business elsewhere, or a competitor has an innovative new product, or that COVID-19 strikes. Strategies are instantly outdated. In a *wicked world*, the context is constantly changing and managers can no longer assume that decisions with help from experts will guarantee that everything will work out. When faced with complex problems, they 'wing it' and see what happens. If the action was successful, they continue on the same path, if not, they choose another course of action. There is no way to know how effective an action will be until after it has been taken.

In a **chaotic context**, there is no time to explore and investigate, action is needed. When a fire breaks out, you have to act immediately: seek safety and get help. Practice and preparing for fires may help to act spontaneously but each fire is a different story and there is no time for

analysis, action is the only requirement. Only after the facts, can you explore what happened and think of how to prevent and deal with such problems in the future.

It is important to differentiate between simple, complicated, complex and chaotic problems, to know which problems can be managed and how to deal with them. Simple and complicated problems are served by prevailing approaches that offer tools for efficient and effective solutions. In contrast, complex problems need new approaches. A growing number of studies based on complexity sciences offer directions and tools for the new class of complex problems.

Systems intelligence and complexity theories

How can systems thinking help us understand *wicked problems*? Which factors allow *wicked problems* to thrive? Various systems and complexity theories provide answers to these questions.

Systems and systems thinking

A system is an independent whole with its own unique boundaries and identity, made up networks of relationships of various elements. Systems can be physical: a car, a human being, a brain, a virus, a computer, a region, etc. They can also be organizational or conceptual: a business, a sector, a network, a professional group, an accounting system, a political or economic system, country, etc.



Incidents are part of larger systems

Systems thinking has proliferated since the 1940s (Merali & Allen, 2011). Whilst enormous progress had been achieved through analytical reduction and specializations, the scientific community recognized that narrow scopes of investigations meant that connections outside of the scope of study were lost. In the meantime, systems thinking has increasingly gained momentum. Systems thinking ensures that attention is given to interactions both within and across systems. Problems and solutions always take place in the context of interactions:

when there is an argument between two people in a team, there needs to be a team solution; when a team wins a match in football, it is never only the few that scored a goal but it is the success of how the entire team played.

We need to understand that different approaches are prevalent within systems studies. Many systems thinking approaches assume that you can have control and plan. On the contrary, complexity-based approaches are founded on the premise that new developments emerge from interactions, regardless of intentions and goals: evolution instead of planning and design.

<i>Systems approach based on assumption of control</i>	<i>Dynamic systems approach</i>
Systems exist independent of their environment.	Systems are connected to their context and other systems are part of it.
Systems consist of components (sub-systems) which are in turn made up of other components.	Systems consist of interacting systems that influence each other's developments.
Complex phenomena can be tackled by breaking them down into smaller problems.	Complex phenomena are tackled by understanding relationships between problems.
Systems naturally seek equilibrium.	Systems can be thrown off balance through escalations and may even cause new and unexpected directions of development.
Systems in a given category resemble one another: best practices are applicable.	Every system is unique with its own history and context: best practices will not work.
A system's past, present and future are distinct features.	A system's past can have adverse or positive impacts on its present and future.
A system can be adjusted independently of other systems.	Change in one system changes the context and landscape of other systems.
System behaviour is knowable, plannable and manageable.	There is no certainty in system behaviour in terms of knowing, planning and controlling it.
Interventions are separate and specific for each system level. Effects of intervention are localized.	Any intervention affects all levels as micro-macro relationships are found everywhere.
Change is achieved through rational and planned efforts: analysis, action, evaluations. Mistakes are to be avoided.	Change is achieved through trial and error, learning from mistakes and coincidences. Outcomes are uncertain due to systems dynamics.

Systems approach based on assumption of control	Dynamic systems approach
Change is achieved through consensus.	Change is achieved by creating room for diversity.
Strategic planning to realize strategic change: vision for the future is critical.	Strategic change involves responding promptly to changing contexts: focussing on <i>the next step</i> is critical.
Systems are managed in a hierarchy. Effective change is implemented through top-down decision-making and a plan of action.	Dynamic systems are self-regulating and self-organizing. Change can be triggered from all directions, inside and outside, and are never linear. Sudden or gradual possibilities may emerge.

Complex adaptive systems

Complex Adaptive Systems (CAS) theory is a dynamic systems approach, in which complexity is leading. The theory assumes disorder, the unexpected and coincidences. It appreciates that problems may exert unintended influence on one or more systems in unpredictable ways. It also emphasizes the significance of local context and the subjective realities of stakeholders. CAS also highlights that change is continuous and creates new circumstances in which no one has the power of control or decision-making. In analyzing problems whilst bearing in mind these qualities of complex systems, new insights and perspectives offer suggestions for change.

CAS, like other complexity theories, has its own vocabulary that differs from conventional change management. These terms offer a different lens. Examples are: *systems dynamics, adaptation, simple rules, patterns, attractors, emergence, agents, weak signals and self-organization*. We explore this new language to demonstrate how *wicked problems* can be analysed systematically in the rest of the book.

John Holland (1992) introduced Complex Adaptive Systems theory. He described how systems change and reorganize themselves internally in response to problems arising in their environments. Key characteristics of complex adaptive systems⁵ are:

- Relations, interactions and feedback mechanisms are present within and between systems.
- Agents in systems are semi-autonomous; interacting with each other; constantly adapting, learning and evolving with changes.

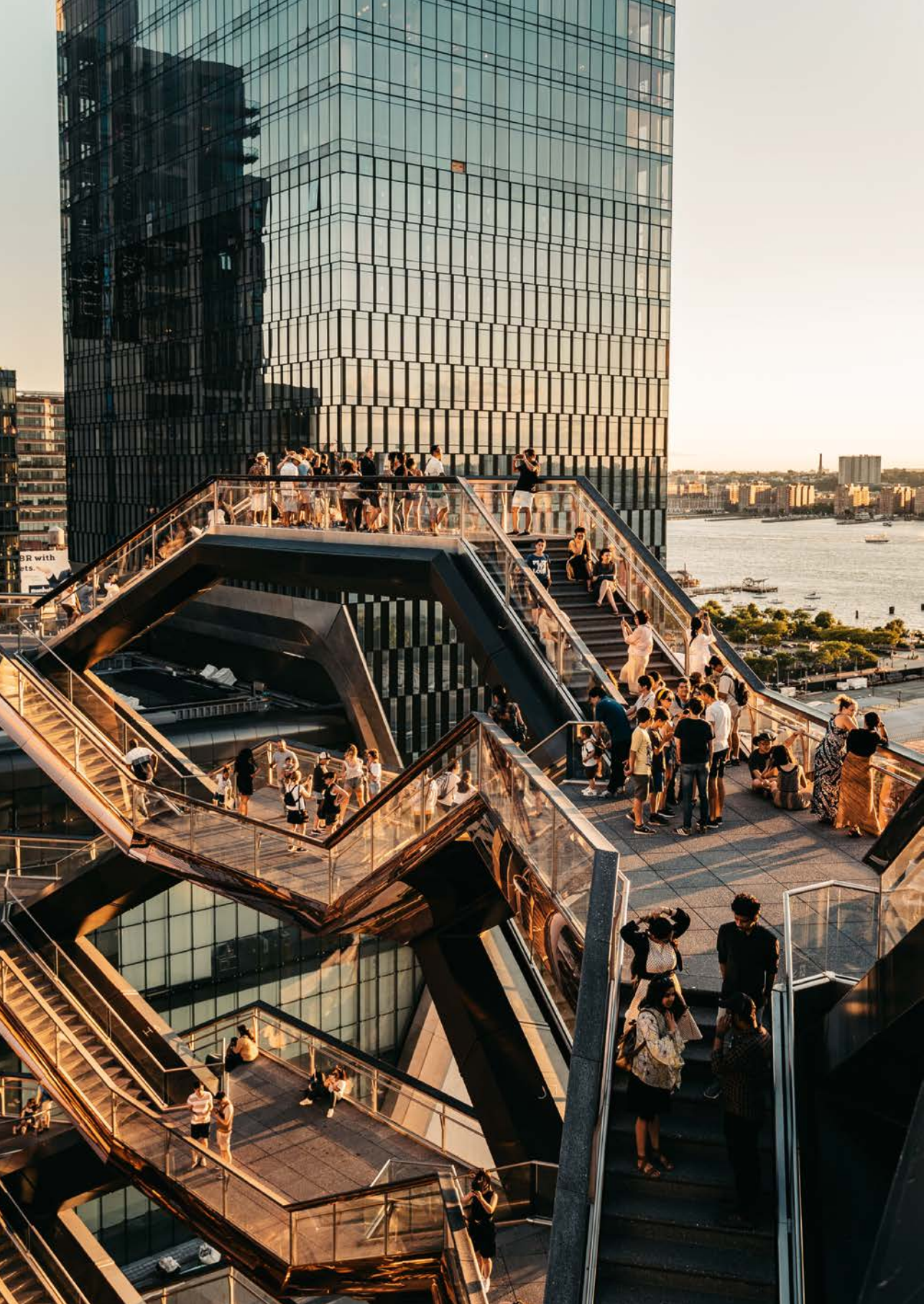
- Evolution implies seeking strategies to fit changing landscapes.
- With complex problems, there is no central control mechanism, instead self-organization emerges.
- Local interactions collectively generate macro-level systems changes (new qualities, interactions, patterns, etc.) that bring about new order to complex situations
- Co-evolution across systems ensues due to interactions with other systems.
- Minor variations in initial conditions can lead to immensely different outcomes.
- Complex adaptive systems function best when order is combined with some chaos, also known as *the edge of chaos*.

Tackling wicked problems in practice

The theoretical principles of CAS require interpretation to make it workable to address practical challenges of *wicked problems*. These working principles have been incorporated into our *systems innovation framework* that is explained in the following chapters.

These working principles include:

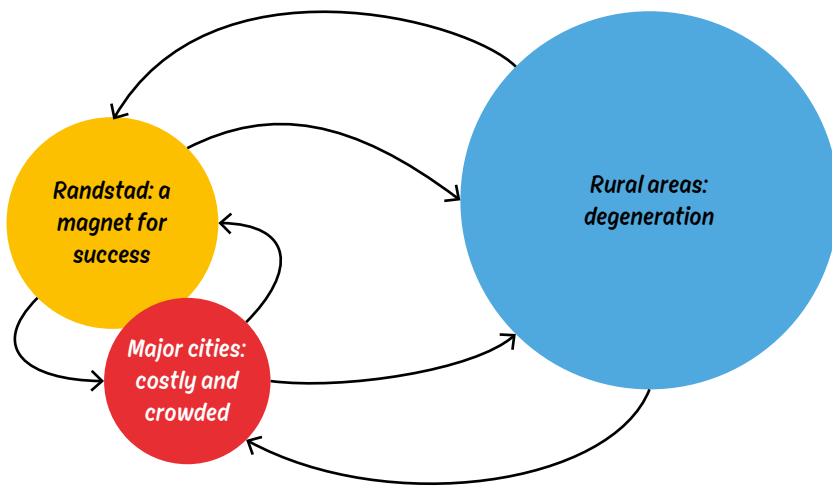
- Map details of the problem including the context.
- Adapt responses to fit the continuously shifting context with alertness to its unique features.
- Expect unpredictability, escalations and lack of control.
- Collaborate with others across disciplines; communicate a lot but listen attentively.
- Explore a variety of perspectives – visions, approaches, solutions, etc.
- Engage stakeholders, ‘agents’ in complexity terms,⁶ in the process.
- Understand stakeholders’ paradigms and communication norms to improve effective intervention possibilities.
- Identify shared values and common interests.
- Identify potential coherence in the complex challenge through visualizations.
- Look for *leverage points* – small interventions with large effects.
- Look for potential side effects of each selected approach.
- Learn and adapt continuously – experiment, use trial and error to learn



Systems dynamics

Wicked problems arise within and between systems. Systems, sub-systems and relationships between systems can be drawn to show interconnections.

To illustrate, in the Netherlands, three distinct 'regional' systems can be identified, these being, the main metropolitan centre (Randstad), other major cities and rural areas. Systems dynamics between these systems show emergence of new patterns such as urban migration, increased prosperity, attractiveness, traffic congestions, crowding and rural degeneration.



The 'Randstad' is a motor of economic growth in the Netherlands.^{7 8} Growth is not as strong in other parts of the country and smaller municipalities, especially in peripheral regions, are lagging behind and becoming less attractive to young people.⁹

Differences between the Randstad, other main cities and rural areas are creating developmental patterns that are difficult to understand without understanding interconnected system patterns. Rural areas are facing issues, such as economic and demographic decline, ageing populations, unemployment, lack of infrastructure, that are affecting quality of life and future prospects. The Randstad also has its share of issues such as congestion, negative effects of mass tourism, inflated housing market and labour market shortages. Similarly, larger cities close to rural areas have become centres serving rural communities with essential and

recreational facilities such as hospitals, schools, stores, sports and cultural facilities, but also for work and to commute to other parts of the country. This Dutch example is typical of urban-rural systems dynamics elsewhere in the world. On a different scale, similar systems dynamics are evident with the magnetic pull of Western countries (prosperity and success) draining lagging economies (depressed economy and prospects) of its wealthy and youthful populations.

An example of this is, increasing waves of illegal migration to Europe across the Mediterranean Sea impacting both European and African countries. It is important to acknowledge that refugees rightfully seek protection and shelter and need to be supported in their flight from conflict. This sub-system of migrants seeking asylum are part of the larger migrant movements facing European and Mediterranean regions and partake in the prevailing systems dynamics. This sub-system however has its own systems dynamics related to its specific situation and issues.

Another aspect of the migration context relates to the impact of large numbers of transient migrants on countries on both sides of the Mediterranean Sea. Other aspects include: refugee camps have created new political tensions between bordering nations and the rest of EU; new political trade-offs have taken place between the EU and Turkey to 'manage' the surge of illegal refugees; growing illicit trafficking trade, detention of migrants in poor facilities and prisons in transition countries like Libya; increased feelings of anxieties and growth of nationalism in segments of EU population, regional and national politics, in part due to economic recession, job-loss, loss of national homogeneity and 'threats' to national identity; perceived and increasing powers of EU, etc.

To deal with *wicked problems*, a first important step is to map related systems and sub-systems to make dilemmas, paradoxes and interconnections visible.

Systems diagrams

Capturing what the 'story' is, is a useful way to grasp complex challenges. *Systems drawings* help visualize relationships between events, experiences, people, interests, themes and so forth. We have included

numerous systems diagrams throughout the book to illustrate how these 'narratives' offer insights into what is happening.

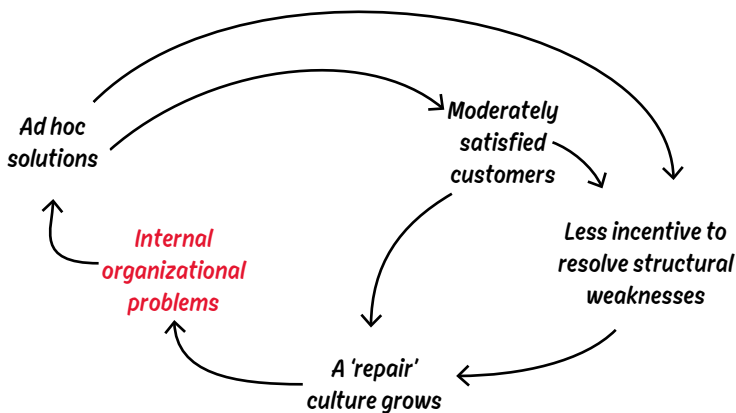
Systems diagrams serve as a narrative account of how different aspects relate to one another, including connecting past, present and future. Different stakeholders have different drawings about the complex problem based on their perspective. When stakeholders compare and discuss their different versions, a new collective diagram emerges. We illustrate how this works through the case of company *Medioc*.

6 Systems diagrams are narratives to understand complexity

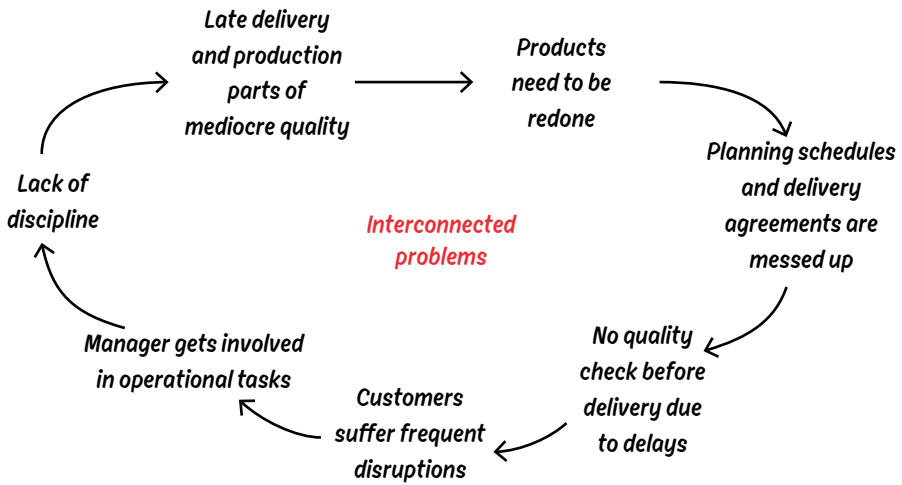
Medioc, a production firm, was facing disappointing results and members of management had different ideas about what was going wrong. They each singled out one aspect as the main cause with a single issue as the problem. These simplifying cause-effect narratives were supported by facts and figures to explain what went wrong: production numbers, financial results, absence of the floor manager, number of customer complaints, clocked overtime in the given period, etc. However, there was agreement that the business was heading in the wrong direction.

To get a better grasp of how the different problems were connected from a systems perspective, they created systems diagrams for each of the issues raised. Each diagram tells a story about that issue.

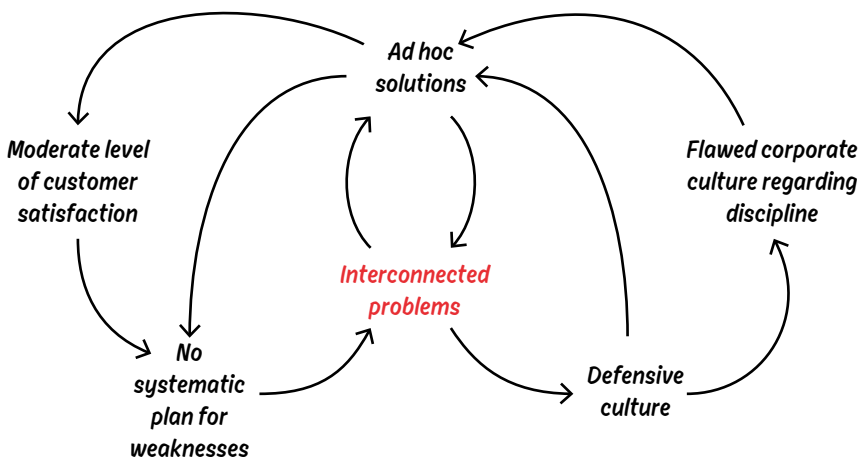
The drawing on their 'ad hoc' practice captures how they solved their problems as they arose to keep clients satisfied. The 'repair' process became normal, clients accepted this even if they were not completely happy and thus structural changes were pushed away.



In another story, the members showed how problems were connected and contributing to other problems.

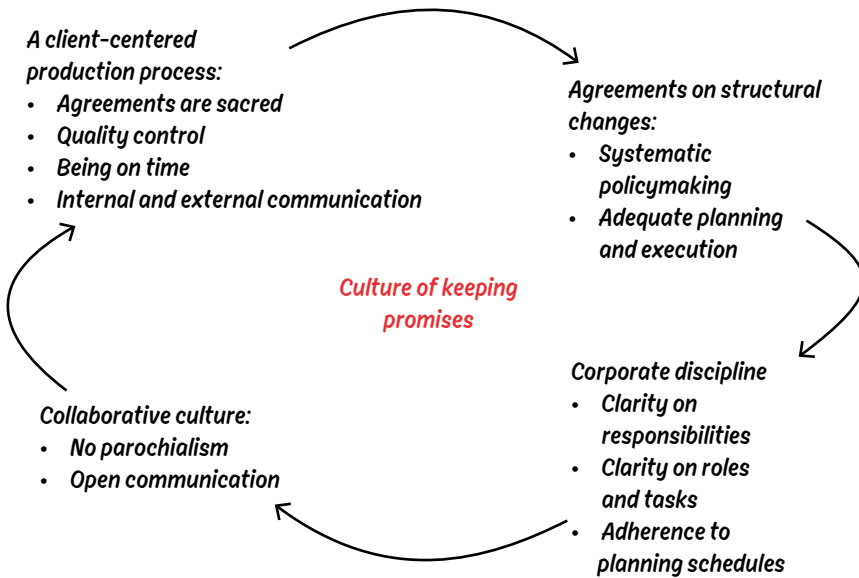


Both stories also show opportunities for addressing problems. When the members got together and compared their stories, they realized that both drawings were 'right'. They continued to discuss the issues at length and identified key aspects that needed to be addressed: problems being interconnected, ad hoc solutions, general malaise in corporate culture, excuses being the norm, attacking structural weaknesses and customer satisfaction. They then created a new diagram to connect these aspects.



This drawing brought their stories to a single narrative, which then allowed them to explore possible interventions together. The strategy for change

was endorsed by the whole management team and captured as *systems drawings* to connect all key aspects to improve business culture and ‘up their game’.



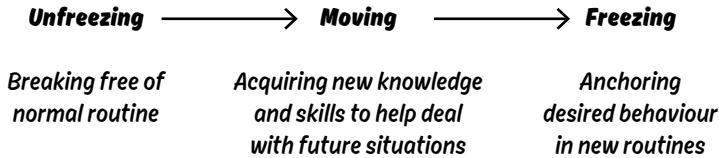
The company had come to terms with what was wrong and have confidence that business results would improve if staff collaborated, had more discipline, listened to customer needs and promises were kept. There was a better appreciation for clarity on roles and responsibilities and a focus on long term structural changes. Drawing their stories and working on uncovering their personal narratives was an important first step for them.

Change

In a complex, dynamic and unpredictable world, things work out differently than we planned or hoped. Controlled, step-by-step approaches to change are not effective in a *wicked world*. We see repeatedly that carefully calculated blue-prints are overtaken by unforeseen circumstances making such plans redundant. At other times, interventions have unintended side effects or aggravates the situation, which then instigates huge resistance.

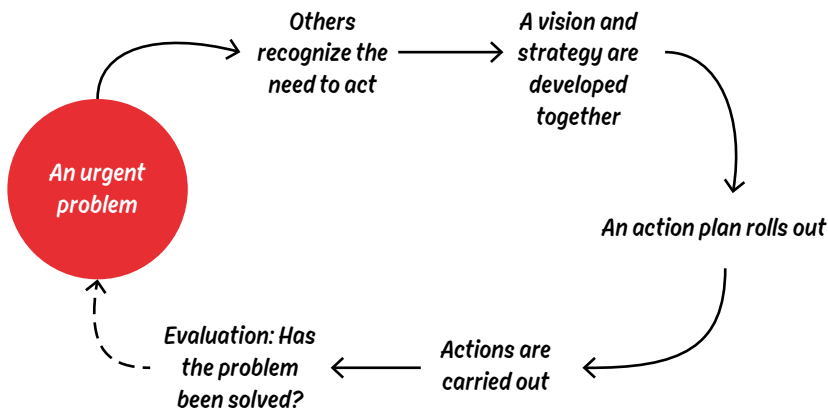
Traditional approach

We have indicated how traditional change models tend to focus on linear or causal change processes aimed at improvements and innovation. A widely used example is Kurt Lewin's three-phase change model (1947).



Linear intervention models fail to account for chaos, complexity, the unexpected or the element of chance. The main focus is manageability, with little attention paid to differing interests and power of stakeholders.

Linear intervention models may take the form of a circle, but the process remains linear.



Changing differently

In seeking new intervention models for complex challenges, the following considerations need to be taken into account.

Complicated versus complex problems

We already described differences between complicated and complex problems. Complicated problems can be solved by specialists using scientific analysis and calculated steps. Complex problems, on the other hand, are connected with other problems and arise from dynamic

interactions of stakeholders and systems. Such problems cannot be solved by specialists alone.

The 2018 UN Climate Change Conference in Katowice was the United Nations' twenty-fourth attempt to reach effective agreements on climate change. The UN wants all parties to be heard - resolutions paved by compromise and watered-down solutions. Complex problems are not solved by gradual steps focussed on gaining consensus.

Micro and macro impacts

Local incidents always impact local contexts, but may also have unexpected impacts elsewhere, often creating changes on a macro level.

To illustrate, the nuclear disaster at Fukushima devastated local communities but also saw massive shifts elsewhere: nuclear energy plants were shut-down, a global awareness and reconsideration of nuclear energy followed, with a new impulse for other energy solutions, consumers and governments alike.

Another example, the Twin Towers incident on 11 September 2001 and the subsequent response of the United States resulting in worldwide polarizations, demonstrates micro -macro level consequences.

Economic and political crises

Economic and political crises can have similar impacts. Due to an unexpected economic crisis in the United States in 2007, the housing market stagnated, leading to the collapse of two American banks, which in turn, escalated the economic crisis in the us. This in turn, triggered a major global credit crisis and a deep political crisis in Europe.

It is important to understand that interventions addressing local issues may trigger escalations in other systems levels.

Mass movements

Mass movements and mass communications frame developments and need to be considered when designing intervention models.

The escalation of refugee and migrant numbers entering Europe have caused unexpected consequences and responses at the local, national, regional and European levels.

Social media were hugely responsible for the growth of the *gilets jaunes* (yellow vest) protests in France. It began in November 2018 as a protest against rising fuel taxes on petrol and diesel but soon expanded into a protest against rising costs across France. Similar protests spread to other countries.

A 'hashtag' (#MeToo) launched in October of 2017 went viral on Twitter to explode into the #MeToo movement against sexual harassment and assault of women globally. This movement, fed by social media, brought about dramatic changes in organizations and individual's lives.

Management executives seem to be caught off guard by self-organized mass movements. It is important to understand that mass communication through media supports bottom-up initiatives and movements.

Local conditions

Change models must take into account local conditions. Each system, each context is unique. *Best practices*, the recipe for success for a given situation, cannot simply be copied into a different context. When change takes place in systems, history and geography play an important role.

Interpretations of reality

Reality is in no way objective or unambiguous. There is no such thing as 'the reality'. Interpretations of reality reflect viewpoints of specific persons or groups. In complex problems, various stakeholders are involved and could include scientists, religious groups, trade unions, shareholders, environmental activists, politicians, etc. Each group has its own worldview and interpretation of reality. This means that complex problems are defined differently by different stakeholders.

Perceptions of all stakeholders need to be considered when designing interventions. Also, how stakeholders relate to each other also determines if solutions are imminent. Coalitions are needed for solving complex problems and could include creating power coalitions. However, when escalations arise, outcomes are unpredictable.

Disruptive innovations

Disruptive innovations are a rude awakening for *business as usual* and make plans for change irrelevant. Personal computers, smartphones,

artificial intelligence, robotization, self-driving cars, genetic engineering, 3-D printing are examples. Often, such developments are under the radar of organizations.

Being alert to developments outside one's boundaries, is obligatory for leaders of change in a *wicked world*.

Interactions

New insights, patterns, phenomena and organizational structures can come out of interactions spontaneously. Tensions between the Muslim world and the West, the Euro crisis, rise of nationalism in Europe, effects of social media and youth climate change protests are some examples. Interactions between top-down and bottom-up initiatives also contribute to change whereby self-organization processes are reinforced.

Different system levels

Spontaneous or prompted changes impact different system levels. An intervention at one system level – a business, a province, a country, a profession – will affect other system levels as well. Organizations do not typically give much thought to what their corporate strategies mean for the lives of individual employees or the broader environment. Businesses have long assumed that their core activities, profit maximization and being a good employer were their primary goals. They did not feel responsible for the environment or depletion of natural resources. Likewise, for a long time, individuals did not realize that their lifestyles, air travel, car ownership, food and energy consumption, etc., were impacting Earth's macrosystems.

When Maureen and Tony Wheeler wrote their first *Lonely Planet* travel guide in 1973 to encourage individual travel, they did not envisage that mass tourism would create havoc for many cities and communities. An article in a Dutch newspaper describes the *Lonely Planet* guides as the largest gentrification machine of the travel sector: 'Everywhere you go, the same thing happens in poor neighbourhoods of major cities: yuppies arrive, the locality becomes hip and former residents are effectively priced out of the area' (Bouma, 2018).

Two operating systems

To 'change differently', revisions are needed to existing organizational structures and processes. In a 2012 article published in the *Harvard Business Review*, John P. Kotter states that today's organizations must have two complementary operating systems in place: one to take care of matters that can be planned and managed, and one to deal with rapid and complex changes.

The first operating system focuses on achieving effective and efficient operating processes and optimal results. This operating system includes monitoring and managing structures and supportive instruments such as hierarchical structures and functions, departments, planning, budgeting, specialized staff, data inputs and analyses. A change trajectory involves *business cases* and special project teams that will support and guide change from A to B. The trajectory will be monitored through the process

for adequate progress. This operating system works for simple or complicated problems.



Build flexibility through dual operating systems

Dealing with complex problems in their dynamic and increasingly changing contexts demand a different operating system. One that can respond quickly, flexibly and creatively. Kotter (2018) identifies eight accelerators that need to be simultaneously and continuously part of this second operating system. The most significant difference between this and the traditional operating system is that the process is guided through a coalition formed by networks of 'volunteers' from across the organization.

Characteristics of operating systems for effective change (based on Kotter, 2012 & 2018)

Operating systems	Change	Characteristics	Process management	Measuring
'Business as usual'	Developing business cases	Traditional management system: hierarchy, departments, positions, planning, budgeting, experts, staff, procedures, instruments, incentives, evaluations, accountability checks Bureaucratic and political interests	Change goals Project team Road map or plan	Baseline, interim and end measurement

Operating systems	Change	Characteristics	Process management	Measuring
Rapidly changing complex contexts	Networking	<p>'Volunteer army' from across the organization</p> <p>Dynamic and political interests</p>	<p>Process guided by means of eight accelerators aimed at 'big opportunities':</p> <ol style="list-style-type: none"> 1 Creating urgency 2 Establishing a company-wide guidance team 3 Establishing strategic vision and initiatives 4 Promoting voluntary participation ('volunteer army') 5 Removing barriers to promote action 6 Celebrating relevant quick wins 7 Maintaining urgency and focus 8 Integrate successful methods into organizational structure 	Seek, act, learn and adapt immediately

In conclusion

As human beings, we have the ability to discover relationships and patterns and to predict how things will unfold. However, we live in a *wicked world* where chance, disagreements, unforeseen power and external influences can cause subtle changes and power struggles where outcomes are uncertain. The complex world can never be fully understood or planned as everything is constantly evolving and interconnected. We struggle with the *wicked world* as it relentlessly escapes our grasp.

Systems and complexity theories can help us deal with complexities of the world. These theories show how *wicked problems* emerge in a landscape of systems constantly reacting to each other. Uncovering underlying systems dynamics will make *systems innovation* possible.