

# THINKING IN SYSTEMS: A PRIMER

*by Donella H. Meadows*

INSIGHTS BY:

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## ABOUT:

This is a comprehensive summary of the book *Thinking in Systems: A Primer* by Donella H. Meadows. Covering the key ideas and proposing practical ways for achieving what's mentioned in the text. Written by book fanatic and online librarian Ivaylo Durmonski. (Printable available only for supporting members.)

## HIGHLIGHTS:

- Systems are everywhere around us. We are part of different systems whether we realize it or not. That's why spending time unveiling the various components of the systems you're part of is crucial.
- Consider the limiting factor in your system to make positive changes. For instance, companies won't become more profitable if their product sucks, no matter how good their marketing is.
- We tend to fill the gap between how we feel now and how we want to feel with quick solutions that eventually become addictive. This is a trap. Instead, we need to focus on strengthening our inner systems.

## ABSTRACT:

Elegant presentation of the various systems that exist in the world. This book is a distillation of thirty years of systems modeling. Completed in 2001, *Thinking in Systems* doesn't see the light of day till 2008 because of the unexpected death of the author. With her work, Meadows wants to enhance our ability to navigate around the increasingly complex feedback loops that are running the world. To help us spot damaging patterns in our behavior and institutions. Discover the true cause of the problems we encounter in order to make the right adjustments in both the way we think and act.

## THE CORE IDEA:

*Thinking in Systems* allows you to see under the hood of different groups, organizations, and even individuals. According to Donella H. Meadows, everything is a system – yes, even individuals. Once we understand what motivates people, what drives certain behavior, we can uncover the main system fueling their actions. And once we spot these patterns, we can predict behaviors, work better with these people and help them make changes to their current approach, so they can make progress, faster.

## KEY LESSONS FROM THINKING IN SYSTEMS:

- LESSON #1: A SYSTEM IS MORE THAN THE SUM OF ITS PARTS
- LESSON #2: IF YOU WANT TO MAKE A CHANGE, FOCUS ON CHANGING THE PURPOSE
- LESSON #3: TRY TO FIND THE SYSTEM IN EVERYTHING AROUND
- LESSON #4: INFORMATION DELIVERED BY A FEEDBACK LOOP AFFECTS FUTURE BEHAVIOR
- LESSON #5: YOU CANNOT HAVE INFINITE GROWTH IN A FINITE ENVIRONMENT
- LESSON #6: UNDERSTAND THE LIMITING FACTORS AND KEEP IN MIND THAT THEY ALWAYS CHANGE
- LESSON #7: BEWARE FROM SHIFTING THE BURDEN

## LESSON #1:

# A SYSTEM IS MORE THAN THE SUM OF ITS PARTS

Imagine a football team. You might think that it's just 11 dudes running on the field, but it's more than that.

A football team is a complex system. We have players, coaches, the field, and the ball. A single player, regardless of his skills and ambitions, cannot win the game alone – he's bound to be part of the system if he wants to prevail against the other team. This practically means that all players are connected. The whole team is obeying the rules of the game and also following their coach's strategy.

The purpose of the team?

To win the game. Get famous. Get rich. Or simply enjoy an afternoon ball-kick.

This is, of course, an oversimplified example of what is a system.

Donella Meadows explains that there are systems everywhere and a system is more than the sum of its parts – 11 people play better when they play together in a team, not when each of them plays for himself. Furthermore, to explain system-thinking better, the author adds, “If you look at that definition closely for a minute, you can see that a system must consist of three kinds of things: elements, interconnections, and a function or purpose.”

If we look at the example of the football team again, we can differentiate the following components:

- **Elements:** Players, coach, field, ball, crowd.
- **Interconnections:** Rules of the game, communication, strategy, the crowd cheering or shouting.
- **Purpose:** Win the game. Or, for example, have fun.

Remove or change a single part of the above description, and you will then have a completely different system with a completely different purpose.

For instance, if the purpose is not winning but having fun, then the way people play will change. Or, if you change the ball, the physical laws that govern the motions of the ball will be different. Then, we might have rugby or baseball – or something completely new.

In short, the system causes its own behavior. All the elements in a system are leading to certain expected actions. If what you’re doing is not related to the rules of the system, then you’re out.



Hopefully now, you can see why it's important to invest more in system thinking.

You not only see how things connect, note the relationships between the different elements, but you can also reveal the true purpose of the systems in which you participate.

The categorization of what is a system the author makes will help you identify the players and their purposes. This, undoubtedly, will assist you in making better future decisions.

But above all – the most important part I believe – is that this knowledge will help you spot the individual goals of the different players. As noted, while a system is more than the sum of its parts, many players are playing solo – intentionally or not. Once you know who is playing what type of game, you can make proper improvements to your strategy.

*“Systems can be nested within systems. Therefore, there can be purposes within purposes. The purpose of a university is to discover and preserve knowledge and pass it on to new generations. Within the university, the purpose of a student may be to get good grades, the purpose of a professor may be to get tenure, the purpose of an administrator may be to balance the budget.” Donella H. Meadows*

## LESSON #2:

# IF YOU WANT TO MAKE A CHANGE, FOCUS ON CHANGING THE PURPOSE

If we continue with the example from above, what do you think will happen if we change all the players in a football team?

What do you think will change besides the bodies beneath the expensive ad-rich uniforms?

Not much. As the author writes, “If you change all the players on a football team, it is still recognizably a football team. (It may play much better or much worse—particular elements in a system can indeed be important.)”

The behavior of the players will still be strongly related and aimed at the goal – winning the game.

And while we as a society don't need to think about changing the purpose of a football team. We, collectively, need to think about changing the purpose and the way governments and institutions

think.

Donella Meadows explains how an oil-based economy should approach the consumption of oil. Instead of focusing on finding more oil, she explains that we should simply burn less oil and create a world where less oil is required in general.

A similar way of thinking can be applied to other situations, of course. For instance, you can hire more people if your workload increases. Or you can find ways to reduce the workflow – by automation, removing unnecessary tasks, or simply fire fewer people.

People rarely think like that. At least that's what the author states.

Donella Meadows notes that we focus mainly on the inflows. We focus on making more money, we don't think about reducing our costs. And while this is not bad per se, we forget about one important thing: change happens slowly.

Even if you are working on ways to change your system for the better – learning new skills to get a new, higher-paying job – this won't happen overnight. There are always delays. Lags. If you don't consider the time it will take you to benefit from the changes you're implementing now, you might “burn all of your oil” before you reach the desired outcome.

This leads me to the following conclusion for this lesson: Even if you are working on making positive changes to your life so you can become financially healthy, these corrections won't be long-

term solutions if you don't adjust your purpose. You can strive for more money, but if you don't consider reducing the outflow of your cash, you can still be poor.

Similarly, you can demolish a factory because it's underperforming, but if you don't change the way people think about doing business, they will simply produce another factory doing the same mistakes – simply on a different location.

That's why governments don't make lasting changes. People in the government switch, but their purpose stays the same – shortsighted.

*“Once an economy has a lot of oil-burning furnaces and automobile engines, it cannot change quickly to furnaces and engines that burn a different fuel, even if the price of oil suddenly changes. It has taken decades to accumulate the stratospheric pollutants that destroy the earth's ozone layer; it will take decades for those pollutants to be removed.” Donella H. Meadows*

## LESSON #3:

# TRY TO FIND THE SYSTEM IN EVERYTHING AROUND

There are systems everywhere. And they don't operate singly.

Our world is complex and as A causes B, it is also possible for B to cause A.

Think about it...

The lack of jobs can cause poverty. But also poverty reinforces the lack of jobs. After all, it will be extremely hard for a poor community to produce enough big corporations that can create jobs. And even more importantly, the way a poor community thinks is usually not that ambitious. People will focus on the here and now. On surviving, not thriving in the future. There is simply no other way for them to operate.

Meadows includes a lot of pictures in the book full of pipes and faucets that represent the inflow and the outflows in different

systems. Usually, a simple system will consist of one inflow that is generating “stock” and one outflow that is spending the amount of stock generated. For example, you gain money (inflow) and you spend money (outflow).

But as just stated, there are systems all around us that work together.

One of the examples in the book is of a thermostat mechanism that regulates the heating of a room. The inflow of heat here comes from the thermostat. The thermostat is working to change the temperature of the room. The outflow is the outside temperature. In this situation, when the room reaches the desired temperature, the thermostat will stop working – at least for a while. When the temperature falls under the tuned 18 degrees, for example, it will start working again.

Meadows calls this “Two Competing Balancing Loops.”

The thermostat is trying hard to heat the room while the outside temperature is doing the opposite.

Now imagine that you’re part of a community where there are not enough jobs for everyone. Since the inflow of jobs is not enough to shelter the big outflow – the people wanting to get a job – the result will be higher competition and people without jobs.

The problem here is how to balance the loops, right?

Creating more jobs is surely a solution. But another way to tackle

this is by providing resources to the people without jobs to create their own reinforcing loops – their own businesses, for example.

*“Reinforcing loops are found wherever a system element has the ability to reproduce itself or to grow as a constant fraction of itself. Remember the example of the interest-bearing bank account? The more money you have in the bank, the more interest you earn, which is added to the money already in the bank, where it earns even more interest.” Donella H. Meadows*

## LESSON #4:

# INFORMATION DELIVERED BY A FEEDBACK LOOP AFFECTS FUTURE BEHAVIOR

Say you are not earning enough. Or at least not as much as you want to earn. What do you do?

You assess your current situation – your current system – and you try to find an alternative solution. You might think about: What type of work you do now? What's happening in the economy? What others are doing?

Based on the answers, you may decide to change your daily actions – start learning new skills to get a better job or start a business, for example.

The act of starting a business (which is an entirely different set of systems) is designed to change your money-making system. However, the important thing the author highlights is that these changes can only affect our future behavior and our future condition.



After all, you can't expect your new business to get you immediate results. It will take months, sometimes even years, to reap the fruits of your labor.

Of course, there are a lot of other factors involved but let's focus on the main thing here.

After you've analyzed that your current income is not enough and that starting a business is a good idea, you're unsure of whether the results you're hoping for will actually come true.

Although you may have a strong gut feeling that you're going to "make it", there is no way to successfully predict the future. You're simply guessing. Betting on a possible future.

Fortunately, Meadows is giving us three questions to ponder on that will help us make possibly better predictions:

- Are the driving factors likely to unfold this way?
- If they did, would the system react this way?
- What is driving the driving factors?

Let's put these into context:

- What are you going to do to drive people to your business, and what the people who are seeing your business likely to do?
- Are people visiting your shop/website behave as you think they will – i.e., purchase your products?
- What is the main thing that will convince people to purchase

from you?

Regardless of your answers, it's important to understand that you don't really know what will happen. You judge your own scenario and based on your conclusions, you work hard on the scenario you believe is possible. Essentially, you explore *what would happen*. And what would happen, is heavily influenced by two things: 1) How good is your system (the inflows); 2) What are the other external factors – what external systems influence your own system.

In both cases, we need to accept that our actions won't produce immediate results. There will be delays. And these delays are important to understand when you think in systems because it helps us focus on the things you can manage and also make adjustments based on the things you can't.

*“The most important delay in this system is the one that is not under the direct control of the car dealer. It's the delay in delivery from the factory. But even without the ability to change that part of her system, the dealer can learn to manage inventory quite well. Changing the delays in a system can make it much easier or much harder to manage.” Donella H. Meadows*

## LESSON #5:

# YOU CANNOT HAVE INFINITE GROWTH IN A FINITE ENVIRONMENT

In spite of your commitment and your resources, you're bound to run into some kind of constraints that will hinder your growth.

According to the author, system thinkers call this the "limits-go-growth" archetype.

Donella includes a couple of examples for us to understand this better: "A chain reaction in a nuclear power plant or bomb will run out of fuel. A virus will run out of susceptible people to infect. An economy may be constrained by physical capital or monetary capital or labor or markets or management or resources or pollution."

Thinking that your business can grow forever is not adequate. In the physical world, there cannot be infinite growth.

You are probably expecting a steady growth of your stocks or of

your business every year. But this directly contradicts with the physical laws and with the systems running our world.

That's why it's vital to identify what are the growth loops in a system and also what are the balancing loops trying to hinder your growth. This helps us spot what are the limitations.

For a business owner, for example, the limiting loops might be: competitors, global economy, technological progress, your inability to stay on top of things, toxic work culture, equipment wearing out, etc.

Even if you're working hard to get around the systems trying to bring you down, the system is adjusting. Dynamically shifting and introducing new barriers in the future.

But there is more to this...

Here comes two interesting concepts that are worth exploring:

Are you working with renewable resources or are you working with nonrenewable resources?

Nonrenewable resources are, as you can guess by the name, stock-limited. If you find a gold mine, the faster you work, the faster you'll extract and deplete the resource. We can't expect new gold to re-appear.

In contrast, renewable resources are flowlimited. They support themselves but there are certain limits, too. For example,

generating power from wind by using a wind turbine is determined by the flow of the wind. Or, if you're working on a farm, you need to allow the soil and the crops to regenerate to extract the resources. Or in other words, you need to understand the cycle of the renewable resource so you can keep them renewing.

Simply put, systems are complex. Besides considering the inflows and the outflows of our structure. We need to understand what are the limiting loops trying to sabotage us. Also, to ask ourselves: Are we working with renewable or nonrenewable resources, and what are their qualifications?

*“The trick, as with all the behavioral possibilities of complex systems, is to recognize what structures contain which latent behaviors, and what conditions release those behaviors—and, where possible, to arrange the structures and conditions to reduce the probability of destructive behaviors and to encourage the possibility of beneficial ones.” Donella H. Meadows*

## LESSON #6:

# UNDERSTAND THE LIMITING FACTORS AND KEEP IN MIND THAT THEY ALWAYS CHANGE

Commonly, we think about one system producing single effects. Your exercise (your system) hoping to lose weight (the desired effect). However, we hardly think about the bigger picture.

In a dynamic world, you can't expect a single system to get you the desired result. You need to consider all the systems involved and how they are influencing the outcomes you're trying to achieve. Simply put, multiple adjustments are needed to produce a meaningful output. In our case, you also need to change your diet if you want to "fix" your heavy body.

In system thinking, this is labeled as the "law of the minimum."

Here's an explanation: "Bread will not rise without yeast, no matter how much flour it has. Children will not thrive without protein, no matter how many carbohydrates they eat. Companies can't keep going without energy, no matter how many customers

they have—or without customers, no matter how much energy they have.”

You can have the best sales team in the world, but if your product sucks, you will soon reach a brick wall. In this case, your product is your limiting factor. Therefore, you need to create a better product. But this doesn't stop there. Even if you create a better product, you must train your sales team to present the new product properly. If they fail, this will be your new limiting factor.

Another great example shared in the book is the following: “Rich countries transfer capital or technology to poor ones and wonder why the economies of the receiving countries still don't develop, never thinking that capital or technology may not be the most limiting factors.”

Imagine meeting someone from Somalia – one of the poorest countries in Africa. Say that this person is part of the poorest population. To help out, you give this person a laptop for free. Hoping that this person will harness the power of the internet, so he can earn money online. But will giving someone only the tool guarantee success? Not really. The limiting factor in this example is the lack of knowledge and probably even the lack of resources to actually start a business online.

So yes, thinking about what is your limiting factor at this precise moment is quite useful. You can train hard, but if you don't adjust your diet, you probably won't make much progress. But even if you change the way you eat, you need to understand that this will probably create a new limiting factor – probably now you don't

have enough energy to exercise.

*“There are layers of limits around every growing plant, child, epidemic, new product, technological advance, company, city, economy, and population. Insight comes not only from recognizing which factor is limiting, but from seeing that growth itself depletes or enhances limits and therefore changes what is limiting.” Donella H. Meadows*



LESSON #7:

## BEWARE FROM SHIFTING THE BURDEN

Towards the end of the book, we find ourselves in the middle of a battlefield.

A war between us right now and where we want to be in the future.

What's standing between?

Systematic behavior that is undermining our performance.

Although what Donella Meadows teaches about systems helps you create a straightforward way to think about how to run your business, life, form habits, live in general, things often get messy. There are certain systems that emerge whose main goal is to cause trouble.

The author calls these “problematic behavior archetypes.” They

cause chaos. And once spotted, these troublemakers need to be quickly removed or altered.

One of these hidden traps is called: Shifting the burden to the intervenor.

Here's an explanation and how we fall for it:

There is a gap between how you feel now and how you want to feel. Say you want to lose weight. The traditional way – and the proper way – to get rid of the extra body fat is by eating healthy and regularly exercising. Sadly, we all know that this takes time + effort. And we, humans, hate to wait. Is there an alternative? Yes. Pharmaceutical companies are heavily advertising “magic” pills that will make you slimmer. The catch? You need to take them forever.

So here's what happens. We shift the solution of our problem – the extra weight – to the intervenor – the pills in this case. Unfortunately, this is a short-term solution. And not only, this probably even corrupts our immune system.

After a while, taking pills to regulate your weight becomes your system. Instead of solving the problem by creating a daily routine that will help you craft the body you want, you become dependent on the drug. Probably you're desperate. Don't have the energy to work out. Or you don't want to wait. Whatever it is, this hooks you into a regressing behavior.

This system trap is something common. People get addicted

to all kinds of things: alcohol, cigarettes, drugs, video games, and even TV shows because they want to feel better now, at this moment. They don't want to wait. Instead of creating an internal system that will lead to happiness, we outsource the happiness to external objects – activity, drug, expensive object, a person even. This makes us addicted to this... thing. Therefore, we lose our ability to self-maintain.

The solution is this:

Avoid getting into the trap in the first place. That's the best fix. Don't outsource the solution of your problem to something that will eventually cause addiction. Embrace hard work and create internal systems in your life that will lead to the desired destination. Even if this will take time.

*“Take the focus off short-term relief and put it on long term restructuring. If you are the intervenor, work in such a way as to restore or enhance the system's own ability to solve its problems, then remove yourself. If you are the one with an unsupportable dependency, build your system's own capabilities back up before removing the intervention. Do it right away. The longer you wait, the harder the withdrawal process will be.” Donella H. Meadows*

## ACTIONABLE NOTES:

- **Understand bounded rationality:** It's impossible to know everything. We make decisions based on the imperfect information we have. After all, no one can take into account all the possible factors involved in making a decision about buying a new car, for example. There are a lot of things to consider. Bounded rationality can be both a blessing and a curse. But either way, it's vital to understand it. When you're aware that you can't know everything, you make good-enough decisions. For example, if you're indeed looking for a new car, instead of spending months reviewing different models, you might limit your research to 7 days. This will help you make a decision faster. The downside, as you might guess, is that your choice may not be perfect. Still, making progress is far better than staring continuously at review sites or spreadsheets.
- **Identify the systems within the systems:** The country you live in is a system. The town you live in is another system. Your social circle is yet another system. Furthermore, your habits are personal systems you've developed throughout the years or are such that are imposed upon you – your job duties, for example. If you take some time to identify the systems you're in, you can determine their guiding principles and goals. This way, you'll find the best ways to make adjustments based on your personal liking. Focus mainly on the systems you can directly change. There is no point in trying to change how your government works if you're not directly involved in this particular system. You'll only waste energy.

- **Alter the purpose first, not the system:** If you're managing a team and if a person is growing frustrated with the company which negatively influences his performance, transferring him to another team will rarely make a lasting impact. You'd have to try to change his view of the company. Or as discussed above, if you change all the players in a football team, it's essentially still a football team. In this case, you need to change the rules and the purpose of the game if you want different results. This is helpful for the following reason: You can't expect new and better outcomes if your system is essentially the same. But changing the system should come second. You should first change your views about the life you want to live – your purpose. Here's another example: If you want to become a designer, you can start by attending seminars and courses (change your daily system). But it will be more beneficial if you first figure out why you want to become a designer (change the purpose).
- **Escape the success to the successful trap:** Also known as, “the rich are getting richer while the poor are getting poorer,” the success of the successful is a well-known concept. The more someone wins, the more he/she will win in the future. The simplest example is of a big corporation with a lot of resources. Their large portfolio and virtually no cap of resources, is allowing them to invest these resources which makes them even wealthier. The question is: How do you break this cycle so an ordinary person/brand can take a portion of the pie? The answer: Diversify. To avoid starvation, you need to create something that does not directly compete with the big corporations. To do this, you can change the rules of a known game to create a different industry. Similar to what Airbnb and Uber did.
- **Consider the delays in a system:** There are delays everywhere. For

example, the delay between the birth of a child and the time when that child is ready to have a child is something really important for our economics. In business, the shorter the delay – e.g., the time it takes a shipment to arrive – the better. But maintaining a short delay might cost a lot. For example, if you want to deliver products within 24 hours, you'd have to hire a lot of staff. That's hard to maintain. On a personal level, the time it takes you to learn a new skill can influence your future income. However, if you try to learn things in the shortest possible time, this might cause other problems – burnout or the inability to keep healthy relationships with your loved ones. Consider the delays in all the systems around and think about the optimal solutions.

## COMMENTARY

This is not a book about math or computer programming. It's a book about how the world is structured to work and how we can better respond to the events that are bound to happen.

The main thesis in *Thinking in Systems: A Primer* is that everything around us is in direct relationship with other things - a system. The work you do. The country you live in. The relationships you have with your loved ones. Everything is a system.

In short, this is how it works: There are inflows and outflows. The work you do, is your inflow. The outflow, is the salary you get. If the amount you get paid is not sufficient, changing your inflow – how hard you work – will hardly lead to more cash. You need to change the system – switch careers or sell your own services, for example.

Similarly, the way you treat your kids – your system in this case – will lead to a certain way your kids behave.

Donella Meadow's teachings will reveal a hidden world. A dynamic world where everything has consequences. You'll start to see connections between different concepts and finally, start making positive changes in the way you act to move your world in a better direction.

Key takeaway:

Change the way you think. Not what you produce if you want to create something better. As stated in the book, "If a factory is torn down but the rationality which produced it is left standing, then that rationality will simply produce another factory." You can shut down your business if it's not working. But if you think the same thoughts, you will simply produce another factory doing the same old useless things.

## NOTABLE QUOTES:

*“Systems thinking leads to another conclusion, however, waiting, shining, obvious, as soon as we stop being blinded by the illusion of control. It says that there is plenty to do, of a different sort of “doing.” The future can’t be predicted, but it can be envisioned and brought lovingly into being. Systems can’t be controlled, but they can be designed and redesigned.” Donella H. Meadows*

*“We can’t surge forward with certainty into a world of no surprises, but we can expect surprises and learn from them and even profit from them.” Donella H. Meadows*

*“We can’t impose our will on a system. We can listen to what the system tells us, and discover how its properties and our values can work together to bring forth something much better than could ever be produced by our will alone.” Donella H. Meadows*



# WORKSHEET

Reading alone won't help you understand the actionable notes. You need to engage with the content. Answer the question below to plan your next steps:

*1/ Are you trying to figure out everything or are you OK with good-enough decisions?*

*2/ What are the systems in the systems you are part of?*

*3/ "What happens if I change the system? What happens if I change the purpose?"*

*4/ How can you outmaneuver the successful people/systems in your industry?*

*5/ Calculate how long it will take you - the delay - until your hard work pays off:*

# THANKS FOR READING!

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