FIRST PRINCIPLES THINKING REVIEW

in theory and practice

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LETTER FROM THE EDITOR

Dear reader,

The Factory for Innovative Policy Solutions is proud to present you with the second volume of the *First Principles Thinking Review*. In the spring of 2020, we launched this publication with the aim of creating a space to host an international and interdisciplinary conversation about tackling societal challenges with first principles thinking. Over the past several months, a number of returning and first-time authors from different backgrounds and walks of life have contributed their thought-provoking ideas to the *Review*. In the following pages, you will learn about the role of first principles in the scientific method and how they shape the process from coming up with possible explanations, or hypotheses, to generating theories. Furthermore, you will see how first principles thinking can be applied to a wide array of challenges, from fighting homelessness to evaluating business opportunities. Finally, you will be granted an exclusive preview of state-of-the-art research being conducted on first principles thinking as an innovation process.

About this publication

The *Review* is divided into two sections. In the first section, *Theory*, our contributors seek to expand the area of knowledge related to first principles and the associated methodology itself. Here, history, philosophy and the exploration of other problem-solving methods come together in order to better our understanding of what exactly first principles thinking is and how it can be used. In the second section, *Practice*, our contributors investigate different ways of applying the first principles thinking method to societal challenges. This is where abstract ideas are turned into concrete proposals for overcoming real-world problems through first principles thinking.

The *First Principles Thinking Review* is the first of its kind with respect to its scope and focus. Although first principles thinking can be traced back to ancient times, surprisingly little has been done to develop its potential as a catalyst for societal innovation and progress. It is therefore the purpose of this publication to finally change that status quo. By dedicating the pages of the *Review* to create an outlet for interdisciplinary research and experimentation, the Factory for Innovative Policy Solutions hopes to engage as many inquisitive minds as possible in the realization of this project. For this reason, we remain dedicated to the principles of open-access publication and

encourage you, our reader, to share the content found herein and join our global network of first principles thinkers.

Call for submissions

For those readers who would like to see their ideas published in the next issue of the *First Principles Thinking Review*, please submit a draft article through the Factory for Innovative Policy Solutions website, where the editorial guidelines are described in greater length and detail. In the event that you would like to make a contribution but are not sure of how to get an article off the ground, our editorial team welcomes unsolicited emails with rough ideas or topic proposals. Our editors are more than happy to work with you on developing such ideas into articles that can be published and shared with those who are in a position to help implement your ideas to solve the societal challenges you care about. We hope that the articles you find herein shall serve as a source of both inspiration for new ideas as well as the motivation that is necessary to make those ideas a reality.

Sincerely,

Kacper Grass, *editor-in-chief*

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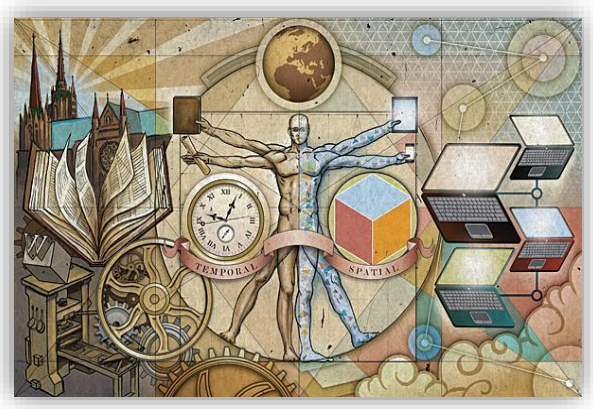
CONTENTS

PART 1 – FIRST PRINCIPLES THINKING

IN THEORY



From First Principles to Theories: Revisiting the Scientific Method Through Abductive, Deductive, and Inductive Reasoning

By Kacper Grass

Originally published electronically on 3 April, 2021 [1]

The aim of this article is to examine how first principles are developed into general theories by reviewing the roles that abduction, deduction, and induction play in the three primary steps of the scientific method: hypothesis generation, hypothesis testing, and theory generation. Kant's democratic peace theory is first used to illustrate this process, and the example is subsequently extended to show the secondary level of scrutiny that theories must undergo before they can be applied to the empirical world. The article concludes by considering the strengths and weaknesses of scientific theories, particularly in the field of social sciences.

Keywords: First principles, theories, abduction, deduction, induction

Introduction

While the modern scientific method is often attributed to the revolution in human reason and rationality that swept across Europe in the age of Enlightenment, its individual steps had

[1] Grass, K. (2021). From First Principles to Theories: Revisiting the Scientific Method Through Abductive, Deductive, and Inductive Reasoning. *Factory for Innovative Policy Solutions*. Retrieved from https://www.innovativepolicysolutions.org/articles/from-first-principles-to-theories-revisiting-the-scientific-method-through-abductive-deductive-and-inductive-reasoning

actually undergone one thousand years of development and refinement before they were finally assembled into a systematic process of inquiry by scholars between the 17th and 19th centuries. It was Aristotle who first distinguished between deductive reasoning, a top-down form of logic whereby conclusions are inferred from empirical observations and fundamental rules, and inductive reasoning, a bottom-up form of logic by which fundamental rules are extrapolated from conclusions based on empirical observations.

In the pursuit of solutions to real-world problems, both methods have been complementary to one another in that deduction allows the researcher to use fundamental rules, or first principles (as Aristotle refers to them), to reach specific conclusions that can later be used to produce generally applicable theories through induction. By repeating this endless process of rigorous scrutiny with the observable yet unexplained phenomena of the natural world, philosophers have been able to create an epistemological framework for human understanding that encompasses everything from Darwin's theory of evolution in the natural sciences to Marx's theory of revolution in the social sciences.

Deduction, induction, and first principles

Rene Descartes, a renowned advocate of deductive reasoning, explored the relationship between deduction and first principles. In his *Principles of Philosophy*, Descartes explains that first principles must possess two conditions. First, "they must be so clear and evident that the human mind […] cannot doubt of their truth" and second, "the knowledge of other things must be so dependent on them [that although] the principles themselves may indeed be known apart from what depends on them, the latter cannot […] be known apart from the former" (Lancaster University, 2003). Accordingly, it is necessary to deduce from those first principles the knowledge of that which depends on them, as "there may be nothing in the whole series of deductions which is not perfectly manifest" (Lancaster University, 2003).

Francis Bacon, a contemporary of Descartes, makes a similar observation. Referring to first principles as axioms, he notes that if a general axiom proves false, then all intermediate axioms deduced from it may be false as well. For this reason, in his *Novum Organum*, Bacon advocates proceeding "regularly and gradually from one axiom to another, so that the most general are not reached till the last" (Simpson, n.d.). Therefore, through induction, "each step up the ladder of intellect is thoroughly tested by observation and experimentation before the next step is taken" and "each confirmed axiom becomes a foothold to a higher truth, with the most general axioms representing the last stage of the process" (Simpson, n.d.).

Abduction and the scientific method

It was not until Charles Sanders Peirce published *Deduction, Induction, and Hypothesis* that the two ancient methods of reasoning were complemented by a more modern counterpart: abductive reasoning. Peirce's approach was based on producing what he called a "case" (hypothesis) from a "result" (conclusion) and a "rule" (first principle). *Figure 1* offers a comparative view of the three methods of reasoning as outlined in Peirce's example of the bag of beans.

Peirce's three-step example		
I. Abduction	***II. Deduction***	***III. Induction***
Rule (first principle): All the beans in this bag are white.	*Rule (first principle)*: All the beans in this bag are white.	*Case (hypothesis)*: These beans are from this bag.
Result (conclusion): These beans are white.	*Case (hypothesis)*: These beans are from this bag.	*Result (conclusion)*: These beans are white.
Case (hypothesis): These beans are from this bag.	*Result (conclusion)*: These beans are white.	*Rule (generalized first principle or theory)*: All the beans in this bag are white.

Figure 1: Abduction, deduction, and induction compared (Bellucci & Pietarinen, n.d.)

While abductive reasoning is the least logically secure of the three methods, it nevertheless facilitates making an inference about the best possible hypotheses to a research question given the limited information available to the researcher. The propositions produced through abduction can be tested subsequently through deduction, by which a valid "result" (conclusion) is inferred from the "case" (hypothesis) and the initial "rule" (first principle). Finally, induction can be used to generalize the products of the previous steps by extrapolating a universal "rule" (generalized first principle or theory) from a specific "result" (conclusion) and a "case" (hypothesis). In this way, the process of abduction-deduction-induction outlines the three basic steps of the scientific method: generating a hypothesis, testing the hypothesis, and generalizing the results or conclusions of the research to generate a theory.

Kant's democratic peace theory

Between the time Descartes and Bacon investigated deductive and inductive reasoning and the time Peirce introduced his method of deduction, Immanuel Kant laid the groundwork for what would come to be known as the democratic peace theory. In *Perpetual Peace*, Kant argues that it is reasonable for people to say that "there ought to be no war among us, for we want to make ourselves into a state; that is, we want to establish a supreme […] power which will reconcile our differences peacefully" (Ferraro, n.d.). In turn, it is also reasonable for the resulting state to say that "there ought to be no war between myself and other states" (Ferraro, n.d.). Therefore, if a group of people "can make itself a republic, which by its nature must be inclined to perpetual peace, this gives a fulcrum to the federation with other states so that they may adhere to it and thus secure freedom under the idea of the law of nations" (Ferraro, n.d.). As this federation of free republics grows, it will eventually expand to immerse the whole world in a league of democratic states that adheres to the universal law of nations, a perpetual peace.

Though Kant preceded Peirce and did not live to learn about abduction, the method can nevertheless be applied to the formation of Kant's democratic peace theory. What follows is a step-by-step application of abductive, deductive, and inductive reasoning to the three steps of the scientific method—hypothesis generation, hypothesis testing, and theory generation—in the development of Kant's democratic peace theory.

I. Abduction (hypothesis generation)

First Principle: The majority of people would not vote for an aggressive war.

Conclusion: Democracies avoid war with one another.

Hypothesis: There can be no war in a democratic world.

Based on the empirical observation that, even when left to their own devices, the majority of people do not behave aggressively with one another and tend to avoid violent conflict, Kant formulated the first principle that the majority of people would not vote for an aggressive war should they be given the choice. Furthermore, if the majority of people in a state would not vote for an aggressive war, then it can be concluded that two states governed by majority rule would avoid war with one another. Therefore, the first step of abductive reasoning leads to the hypothesis that there can be no war in a world composed entirely of democratic states.

II. Deduction (hypothesis testing)

First Principle: The majority of people would not vote for an aggressive war.

Hypothesis: There can be no war in a democratic world.

Conclusion: Democracies avoid war with one another.

In order to test the validity of the hypothesis generated through abduction, it is necessary to see if a logical conclusion can be inferred from its relationship to the original first principle. Indeed, if the majority of people would not vote for an aggressive war, then there can be no war in a democratic world. Thus, the second step of deduction produces a conclusion that is not only logically valid with respect to the hypothesis and first principle but is also empirically observable. Though by contemporary standards there may not have been any truly democratic states in Kant's time, the advent of universal suffrage in the 20th century has produced a considerable community of liberal democracies that do indeed maintain peaceful relations with one another.

III. Induction (theory building)

Hypothesis: There can be no war in a democratic world.

Conclusion: Democracies avoid war with one another.

Generalized first principle or theory: The majority of people would not vote for an aggressive war.

Finally, based on the conclusion deduced from the initial hypothesis, the third and final step of the scientific method aims to generalize the fundamental first principle in order to generate a universally applicable theory. Therefore, if it is already accepted that there can be no war in a democratic world because democracies avoid war with one another, then it can be induced that this is true because the majority of people would not vote for an aggressive war. At this point, the three-step process returns to the first principle with which it began. However, while the first principle was initially nothing more than an axiom based on the empirical observation of individual human behavior, through the scientific method it was developed into a theory that presents a framework for understanding international relations.

From generation to application

Following the first round of the scientific method, what started as a mere hypothesis about human nature is now proposed as a universal theory of global politics. However, before this novel theory can be applied to the empirical world, it should first undergo another round of scientific scrutiny to ensure that the underlying logic that supports it is indeed sound. This time, however, it is not necessary to begin with abductive reasoning as there is no need to generate new hypotheses. Instead, following the initial round of abduction-deduction-induction that led to the theory being generated, the researcher can return to deductive reasoning in order to test its validity on a macro level. *Figure 2* outlines this second round of examination.

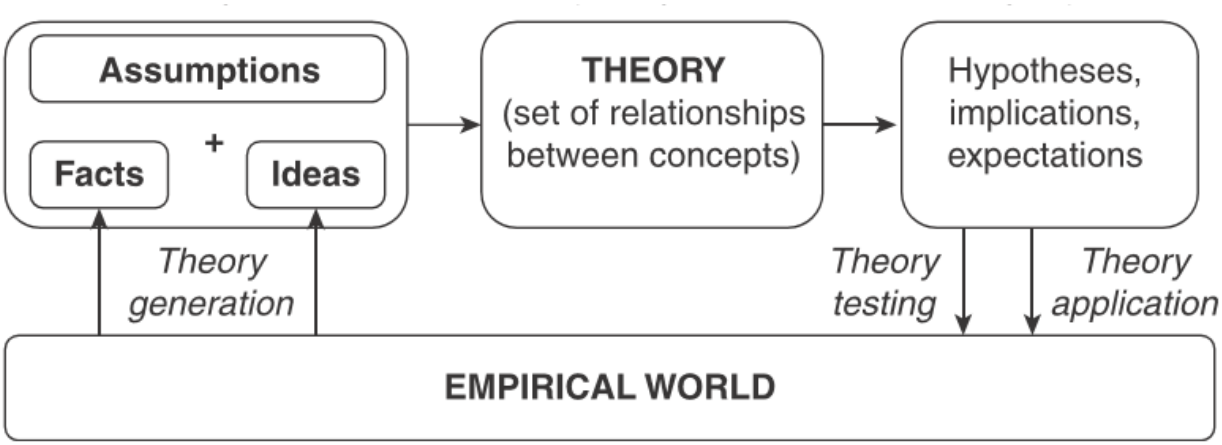


Figure 2: Theory development and the research process (Toshkov 2016, p. 29)

At this point, it is important to begin by reviewing all the initial facts, assumptions, and ideas that form the basis of the theory. In the context of Kant's democratic peace theory, the researcher must ask fundamental questions that might undermine the generalization of the first principle: "Are all societies equally peaceful?" or "Do sociological variables like wealth and culture affect individuals' likelihood of aggression?". Moreover, it is crucial to have clear definitions of all the concepts that comprise the theory: "What are the qualifying characteristics of a democratic state?" and "What exactly is meant by an aggressive war?". By subjecting the theory to such tests, the researcher attempts to reveal any weaknesses that might invalidate the theoretical framework as a whole. Only after this second round of scrutiny can the researcher consider the implications and expectations of the theory before it is ready to be reapplied to the empirical world.

Conclusion

Assuming that Kant's democratic peace theory passes the second round of scrutiny unscathed, can it finally be treated as a scientific law in the same way as Newton's law of gravity, for example? Like laws, theories are epistemologically valuable for their descriptive and explanatory nature. They help researchers understand how things are by making comprehensible connections between abstract concepts and the natural world, and they also help explain why things are by mapping the causal relationships between different phenomena. However, unlike laws, they lack an absolute predictive quality. While the first principle that the majority of people would not vote for an aggressive war may hold true today and is most likely to hold true in the foreseeable future, it cannot be said with certainty that it would hold true under all circumstances. A widespread conspiracy, disinformation campaigns, fear tactics, and manipulation of the democratic process could all plausibly contribute to a violation of this first principle. So far, however, Kant's theory and the first principles on which it rests have given advocates of democratic government reason to be optimistic.

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First Principles Thinking as a Tool to Come Up with Possible Explanations: How Were the Pyramids of Giza Built?

By Alexander Verkerk

Originally published electronically on 16 June, 2021 [2]

First principles thinking can be used for several purposes, ranging from coming up with innovative solutions to contextualising your research and making decisions. The potential of this technique is far reaching, but several of its applications are underexposed. This article provides you with practical insights on another way in which the technique can be helpful: generating potential explanations (hypotheses). The example of finding out how the pyramids of Giza were built is used for illustration purposes and may not always be underpinned by fully accurate assumptions.

Keywords: First principles thinking, hypothesis generation, explaining, pyramid building, Giza, Egypt

[2] Verkerk, A. (2021). First Principles Thinking as a Tool to Come Up with Possible Explanations: How Were the Pyramids of Giza Built? Factory for Innovative Policy Solutions. Retrieved from https://www.innovativepolicysolutions.org/articles/first-principles-thinking-as-a-tool-to-come-up-with-possible-explanations-how-were-the-pyramids-of-giza-built

First principles thinking and generating hypotheses

Have you ever looked at the pyramids of Giza and wondered: how could such incredible structures be built around 4,500 years ago?

Many historians have immersed themselves into this question, and they have come up with several potential explanations for each of the challenges that needed to be overcome. One such challenge concerns the transportation of the pyramid's material from nearby quarries to the pyramid's construction site, as each block is estimated to weigh about 2,268 kilograms (2.5 tonnes) on average (Markings, 2017). How were they transported to the construction site?

I'm not sure what process historians followed to come up with hypotheses, but I can imagine that first principles thinking (FPT)—being a technique that guides you to systematically come up with new solutions by way of reverse-engineering a challenge into scientific fundamental truths and from there reasoning up to discover new solutions—could offer useful guidance for such an exercise. Instead of looking for solutions you look for hypotheses.

How exactly? By pretending to be a 'first principles thinking' pharaoh in Egypt around 2,500 BC with the ambition to build such a polyhedron-shaped mortuary temple in Giza. Once incarnated, we would follow a similar process as the first principles thinking steps outlined in the *First Principles Thinking Manual* (2019) to realise this ambition, while using the knowledge we now have in retrospect.

Note that this pharaoh probably did not start from scratch, as pyramids such as the Bent Pyramid and Djoser's Step Pyramid were built earlier on, which in turn might also have been pre-dated by similar structures such as Mesopotamian ziggurats. However, let's pretend the pharaoh and his architects wanted to create something new as opposed to copying existing structures.

Follow the first principles thinking steps

First principles thinking seems to be most suitable for concrete and demarcated challenges. So we'll have to break down the bigger challenge of building such a pyramid altogether into smaller challenges, such as transporting (components of) large stones from nearby quarries to the construction site. Now let's apply the first principles thinking steps.

Step 1: Identify your objective

Transforming the challenge into an objective statement that captures what needs to be done, for whom and in which locality would look something like this:

- Transport the building material from nearby quarries to the construction site in Giza.

Step 2: List the obstacles

The main obstacles in the way of the objective would be:

- The stones are heavy.
- The stone blocks need to be transported from quarries just outside the pyramid construction site.

Step 3: Question your assumptions

Now let's question the assumptions underlying each obstacle by way of asking fundamental Socratic questions. This is a truth-finding method that questions the validity of one's beliefs and assumptions in a disciplined, rigorous and thoughtful manner.

- Are those stones really heavy? How much do they weigh exactly? How much deadweight can a human carry? How many people would it take? What animals are present to help out? What makes them heavy? Do they need to be carried at all? Is there an alternative? Could the weight temporarily be reduced for transportation? What are the stones made of exactly? Could these ingredients be decomposed and reassembled at the construction site? Is it really far away? How far away is it exactly by land, water, etc.? Can't the departure point and destination meet halfway?

Step 4: Uncover some first principles

To get to the core of the obstacles—the very first principles—we need to try to answer these questions, ideally in a way that is supported by scientific evidence, but otherwise intuition or a search engine query will do for now.

- Each stone weighs approximately 2,268 kilograms (nearly 2.5 tonnes) (Markings, 2017). A person in good physical condition could potentially lift about 210% of their body weight (Sifferman, 2017), let's say about 160 kilograms (0.18 tonnes) of deadweight, and push or pull about 45 kilograms (0.045 tonnes) of horizontal force for a short period of time (Load Mover Inc, 2012). It would take at least 14 people to vertically pull up such a stone, or 56 people to push or pull such a stone, but probably more considering the additional weight caused by friction between the stones and surface. Lions and hippos were around at the time to potentially help out (Mark, 2016). Camels were only introduced many years after the pyramids were built (Saber,1998). Instead of quarrying and transporting the stones, they could be (partially) assembled

using an early form of concrete: a mixture of limestone, clay, lime and water (Berninger & Rose, 2007). The stones were possibly quarried at the Giza Plateau (Ancient Egypt Research Associates, n.d.), which seems to be either at or within a few kilometers from the pyramid construction site.

Step 5: Come up with hypotheses

In a regular FPT exercise you would look at the first principles and ask how-questions to come up with new ideas, such as “How can we reduce the friction between stones and surface?”. If nothing comes to mind you could ask some more questions, such as “What creates friction exactly?”, and find that this is due to the roughness of the surfaces (this is another first principle). A logical how-question would then be: “How can we reduce such roughness?” And then think of the idea to polish the rough surfaces, lubricate them or create the possibility of rolling friction as opposed to sliding friction. “What materials did the Egyptians have at their disposal to make this happen?” Stones to polish, water to lubricate and tree logs to create rolling friction? Indeed, reducing friction can surely be (part of) a possible explanation.

The question “How could the components of a large stone necessary to build the pyramid be transported and then be assembled at the construction site?” might furthermore generate the idea to transport these ingredients in smaller quantities and then assemble them on site. However, knowing retroactively that the stones may indeed have consisted of different components that were cemented unnaturally, we can already confidently hypothesise that these stones were assembled on site, which actually makes the obstacles of the stones being heavy and located outside of the construction site. However, it is a plausible hypothesis nonetheless.

Our goal is achieved; we have arrived at two reasonable hypotheses:

- The Egyptians used stones to polish, water to lubricate and tree logs to create rolling friction in order to ease transportation of the stone blocks.
- The Egyptians brought limestone, clay, lime and water in smaller quantities and assembled them into building blocks on site.

Step 6: Validate your hypotheses

In a regular FPT exercise you would now refine your ideas. Something similar can be done in this context, namely assessing their plausibility by going through a few more rounds of FPT:

- Where would the stones, water and logs to ease transportation come from exactly? How many logs and how much water would be necessary to help transport all of the large stones? Were they available in these quantities?
- Would it be possible to extract smaller quantities of limestone, clay and water? How could these components be transported? How many rounds and people would be necessary? Did they need to cross rough terrain such as a river or hill?
- Is there any evidence of construction and transportation practices, for example in the form of tomb paintings?

Ideally you would be able to get some answers (first principles) and select which hypotheses are most plausible, based on their practical feasibility and effectiveness to overcome the aforementioned obstacles. I will, however, stop here as I don't have the resources to seek further answers.

Conclusion

This article presents an approach to hypothesis generation through the lens of first principles thinking. The key to this approach is to (1) turn an observed outcome or variable into an objective, after which you would (2) identify obstacles to achieve the objective, (3) question your assumptions regarding these obstacles, (4) answer these questions to identify first principles, (5) ask how-questions to come up with possible hypotheses and, finally, (6) validate your hypotheses by asking some more critical questions. As the illustration of pyramid building shows, this process has potential to result in some solid hypotheses, or elements thereof.

A search engine query actually showed that others had also come up with these hypotheses, alongside several others (Ammar, 2014). Did they use FPT? Perhaps in some way, as critical thinking and fact checking underlying traditional hypothesis generation is also fundamental to first principles thinking. Nevertheless, hopefully this article gave you some insights to structure your search for possible explanations, for example when your work or hobby involves empirical research (e.g. process tracing) or investigation (e.g. police work).

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PART 2 – FIRST PRINCIPLES THINKING IN PRACTICE

First Principles Thinking Offers a Helping Hand to the Homeless Elderly in Tangier, Morocco

By Loubna el Morabit

Originally published electronically on 2 May, 2021 [3]

The Covid-19 pandemic has served as a reminder of the challenges faced not only by Morocco's aging population but Moroccan society as a whole. This article addresses the issue of the country's homeless senior citizens who struggle to survive on their own in the absence of proper support from their families or government programs. By drawing on my own experiences in the country and my knowledge of first principles thinking, this article aims to take a preliminary step in the search for solutions to this increasingly relevant challenge.

Keywords: First principles thinking, Morocco, social work

Introduction and objective

Morocco, like most African countries, has a society that enjoys collectivist thought and holds a set of values based on North African culture and oftentimes religion. The main premise of it all is that people take care of one another in a community. This especially applies to the elderly, who generally hold a certain status and respect in their communities. During my travels in the African country I noticed numerous seniors on the

[3] Morabit, L. (2021) First Principles Thinking Offers a Helping Hand to the Homeless Elderly in Tangier, Morocco. *Factory for Innovative Policy Solutions*. Retrieved from https://www.innovativepolicysolutions.org/articles/first-principles-thinking-offers-a-helping-hand-to-the-homeless-elderly-in-tangier-morocco

streets begging for money. This was a continued occurrence in the major cities that I have visited, meaning that there is indeed a problem that is not being addressed. I believe that diving deeper into this matter could be of benefit to those impoverished elderly that have been neglected by both Moroccan society and government. In this article, I draw on my own experiences in Morocco to examine how first principles thinking could be used to overcome the challenge of homelessness among Tangier's senior population.

This article follows the first principles thinking process as outlined by the Factory for Innovative Policy Solutions' manual on first principles thinking (Verkerk & Grass, 2019). Therefore, having identified my objective, I will continue by first listing the obstacles that could prevent me from achieving it and then questioning my assumptions about those obstacles. Next, I will use my own experiences and prior knowledge about Morocco to uncover certain first principles on which to start building actionable solutions. At this point, it is important to note that in order to uncover true first principles, which must be scientifically supported facts, more empirical research on Morocco's elderly population would have to be conducted. For this reason, what follows is an exploratory work whose aim is to uncover a possible path for future developments in this area.

Listing the obstacles

The following obstacles come into mind:

- Lack of nursing homes or residences for senior citizens
- Lack of funding for essentials such as food, clothes and medical aid
- Lack of resources for sustainable projects directed at the elderly
- Logistic difficulty of locating and collecting the elderly off the streets

Questioning my assumptions

- Has Morocco become more of an individualist society?
- Do families reject the elderly because they are poor themselves?
- Are the elderly people begging on the streets of Tangier really homeless?
- Does the local government already help the homeless elderly?

- Is there no money to create senior citizen homes?

Uncovering the first principles

Regarding the question of whether Morocco has become more individualistic in a societal sense, I have to disagree. While it may seem that people do not feel any collective responsibility towards the elderly on the streets, I do not think it is because of selfishness or a lack of empathy. I believe that poverty in general makes people less generous than they would otherwise be, numbing the sense of duty towards others so that they can keep the small bits of resources that they have for themselves. On the other hand, however, I noticed through my travels that these elderly people do not tend to sit in any area that has been designated for the rich. This is mainly because security guards chase them away.

Continuing on that thought, families in financial problems usually do not kick their parents out of the house. In fact, about 96% of the country's elderly population reportedly live with their families (El Masaiti, n.d.). That being said, there have nevertheless been instances in which having one more mouth to feed or taking care of a dependent elder could result in families rejecting them. Rather than taking care of them, the families invest whatever money they have in their children. This results in older people having to fend for themselves, living off whatever retirement money they are entitled to. Another problem is that some elderly leave on their own accord in order not to burden their children. This can also be seen in edlderly people who choose to be admitted to nursing homes in the West. That kind of luxury, however, is only reserved for the affluent.

There is also the question of whether the elderly on the streets are actually homeless or just beg to supplement their small pensions, even though begging is considered a criminal offence in Morocco and can result in up to six months of imprisonment (Alternative Africa, 2019). According to a World Bank report, only 10% of the elderly over the age of 60 receive a pension in Morocco. The same report states that the elderly population is predicted to grow rapidly by the year 2060, which will inevitably put a considerable burden on the country's already strained social security system (Angel-Urdinola et al., 2015). *Figure 1* projects Morocco's age demographics for the coming decades. Unfortunately there is little available data on elderly homelessness in Tangiers, so I will have to rely on my own empirical observations as evidence that it exists and will only worsen due to the aging population.

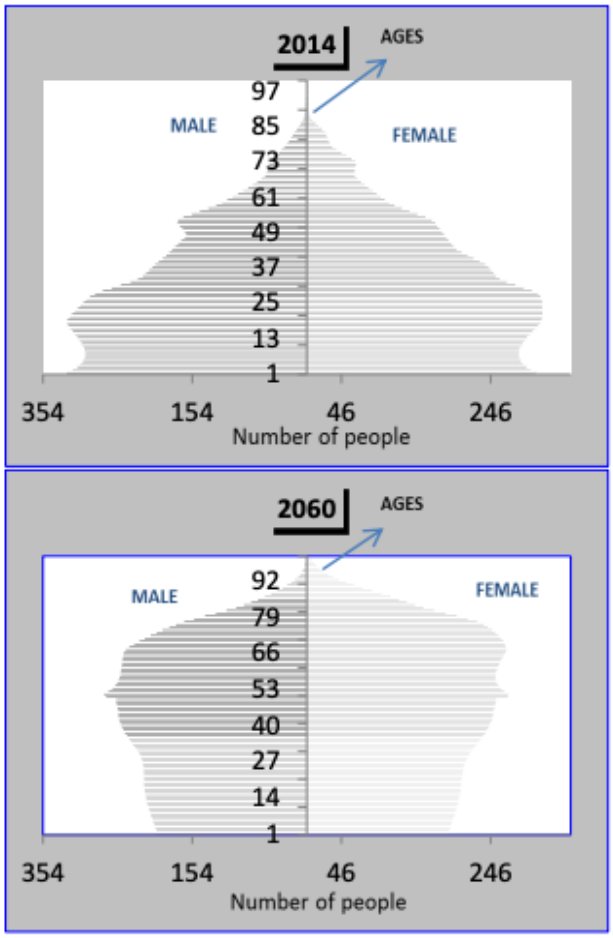

Figure 1: Population pyramids, Morocco, 2014-2060 (World Bank)

In the past, homeless shelters were not as widespread in Morocco as they may have been in many Western cities. However, since the outbreak of the Covid-19 pandemic, several shelters have been built around the country (Gianaris, 2020). Tangier has been no exception, as similar shelters can now be found there as well. This goes to show that, although the Moroccan government is making progress in assisting its homeless population, many of the advances in this area are only recent developments.

With respect to the question of there being enough money to create senior citizen homes, I would say yes. If so many homeless shelters have been built in such a relatively short period of time to battle Covid-19, surely the necessary funds do exist. Therefore, the issue is a matter of prioritising these funds to set up projects that would be beneficial for both the state as well as the elderly population. However, at this point there is no guarantee that government funds will be made available for this cause.

Coming up with a new idea

In the event that further government funds are denied, there is always the alternative option of crowdfunding in the form of *sadaqah*, which is an Arabic term for donating money to a charitable cause or almsgiving. In Morocco it is common to see people working for mosques collecting money for maintenance and upkeep. If many people are happy to donate what they have for the benefit of the mosque, why not encourage them to do the same for the community's elderly population? Instead of making one's entire contribution for the benefit of a religious building that can be found in plenty of areas around the city, why not direct at least part of that money towards the construction of homes where the community's elders could spend their final days with peace and dignity?

Refining my idea

How could we turn this idea into an actual working proposal, and how could we get the message across? I think that religious institutions should promote aiding the elderly as a worthy cause for people to donate their money to. The employment of various social media platforms, which are widely used throughout the country, could also help to spread the idea. But once the idea catches on and becomes accepted, the incentive for people to continue supporting the project needs to last. That is the main goal, it needs to last, and this can only be achieved with a continuous stream of government involvement. While public health centers already exist, the government should also support the construction of community homeless shelters in preparation for the country's approaching demographic shift. With a rapidly growing elderly population, the numbers of homeless elderly are bound to increase as well. In order not to ease the burden on the public health system, it would be in the state's best interest to begin supporting alternative, community-based means of taking care of the elderly population.

Implementation

In the initial stages it would be important to begin by gathering some capital through the use of crowdfunding, or *sadaqah*. From my personal experience, when there is a serious need or a worthy cause, people often respond quickly. Once funding is completed, the second stage would be to start building homeless shelters. To do so, one could team up with the Mohammed V Foundation, for example, which has considerable experience in building homeless shelters in Morocco. The project would consist of constructing two

wings with nine rooms each, three beds per room, a bathhouse and a hostel (FM5, n.d.). However, I would replace the hostel with a medical room.

The third and final stage would be to organize volunteers, for example as an unconventional form of *sadaqah*, that are familiar with the city and know which seniors need help the most. These workers would have the task of reaching out to the homeless elderly and collecting them from the streets. As for medical assistance, collaboration with charitable organizations that offer free services in Tangier, such as the Escuela Capilla del Niño Jesús, would be a valuable asset (World Unite, n.d.). Finally, in order for the project to expand, additional teams would have to be organized in order to ensure the continuation of social media campaigns and crowdfunding efforts.

Conclusion

While my extensive experiences in Morocco lead me to believe that such a project for the benefit of Tangier's elderly population would be both worthwhile and feasible to achieve, further research would have to be conducted in order to uncover more first principles related to this very pressing issue. Nevertheless, I hope that this proposal can serve a step on the path to creating a brighter future for Morocco's aging population. I would go so far as to say it should be considered a human right to be able to spend one's final moments in peace and dignity. There is still much work to be done in making that right a reality.

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Using First Principles Thinking to Evaluate Business Opportunities

By Danielle Peterson

Originally published electronically on 15 May, 2021 [4]

The goal of this article is to demonstrate how First Principles Thinking can be a helpful tool in personal concerns. This article will use this problem-solving method to evaluate multi-level marketing business plans. The author uses an example from her own life as a template for how to apply First Principles Thinking as a critical analysis tool. This article also seeks to illustrate that individuals can customize First Principles Thinking for their own behavioral thinking. Concluding remarks will provide a methodically sound solution to the prospect of joining a multi-level marketing arrangement.

Keywords: Multilevel marketing, business opportunity, work from home, direct sales

Money making opportunity or money taking certainty?

If it hasn't happened to you yet, it will. It's one of life's inevitabilities. Someone you know or perhaps even a perfect stranger will approach you with a business opportunity. These come in all shapes and sizes. You could be selling health supplements, trading in (crypto)currency, or providing financial services. For me, it was the latter.

[4] Peterson, D. (2021). Using First Principles Thinking to Evaluate Business Opportunities. *Factory for Innovative Policy Solutions*. Retrieved from https://www.innovativepolicysolutions.org/articles/using-first-principles-thinking-to-evaluate-business-opportunities

I was sixteen and working part-time in a bridal shop. It was a fun job and my boss was really nice, so my enthusiasm for my job showed when I assisted customers. One customer, the father of a bride-to-be, said he liked my attitude and wanted to hire me for his business. We set a place and time to meet and he gave me his card. I didn't smell anything fishy—he was wearing a suit and had business cards, after all. A real business guy doing real business things, I thought.

Similar situations are repeated countless times each day. Maybe a friend of your sister-in-law approached you about getting in on her great business selling leggings. Or someone you went to school with told you about how you too can make thousands a week (!) trading Bitcoin. Perhaps someone DMed you on Instagram, complimenting you on your style, and they want to collaborate with you for their make-up venture. In any event, there is almost always big money involved and freedom from the 9 to 5 grind.

The business model for these amazing opportunities invariably follows a similar outline—you purchase either goods or training from the person who presents this idea to you. You then need to either sell these goods or services to friends, family, or just whoever. You are also encouraged to share this amazing business opportunity with your friends and family so that they too can sell these products/services. The person from whom you bought them has another level above them in the purchasing chain, and above that another level, and so on until the top of this pyramid is reached. This business model is sometimes called direct-sales but is also known as multi-level marketing.

The promise to make serious cash can be seductive, especially now when so many of us are coping with reduced income and/or opportunity due to the pandemic. Furthermore, their claims seem legitimate at first look. They can show you graphs and charts (like the super legitimate businessman did to me) and they can testify to their own personal prosperity with this program. If the person telling you this is a close friend or family member, it can be even more alluring. After all, why would someone who knows you and cares about you lie to you? But…

Using First Principles Thinking as an analytical tool

But if all this was true there'd be a million more millionaires running around. By the process of deduction, we can tell that many of these claims are bogus. Let's use First Principles Thinking (FPT) as a tool to evaluate these amazing business opportunities. We can use FPT to keep an open mind, systematically question our assumptions and use that to identify the core issue, and then come up with a new idea or an approach to the situation.

This article will present a step-by-step breakdown of the claim that you too can make big bucks with multi-level marketing. Instead of using FPT as a problem-solving process, we will use it as a critical analytical process. In doing so the questions asked/presented in each step may be somewhat different than how it is used in a problem-solving context. So, let's get to it and take a closer look at the riches promised by multi-level marketing business opportunities.

What do I want to get out of this opportunity?

Although freedom from the grind and being your own boss are often showcased as benefits of these opportunities, financial gain is always at the heart. So, for our purposes, let's identify "making a reasonable income from the business opportunity offered" as our objective. Reasonable income can vary from person to person and place to place, but for the sake of this article let's say it would be what you would make if you put your time into an easily-attainable job with comparable hours. Something like serving at a restaurant or working at a drugstore. This could range from several hundred to several thousand a month, depending on your location and experience.

What questions do I need to ask?

Answering the following questions can help you to identify obstacles to reach your objective:

1. Take into account that you must almost always buy the stock/purchase training from the person offering you the opportunity. This is a cost and must be considered when calculating how much actual income you can receive. How much money do I need to invest in this? Why am I required to buy stock directly from this company as opposed to making my own choice for vendors? How much money will I make after my own costs?

2. Do you have the skills to make money from this? Are you a natural salesperson? Do you really understand how financial planning works?

3. How many clients/customers can you get? Do you really know enough people to sell thousands of dollars worth of product/services to? Do these people have the money to buy these products?

What are the underlying assumptions and first principles?

In my situation the assumption was “I am good at my job here at the bridal shop, so why shouldn’t I be good at this job?” That, I believe, is the assumption behind these business opportunities—the concept that you are competent and therefore you can make money with anything you try.

However, using FPT, we can do a little mini-rundown for this assumption. Why would I, a teenage girl who worked in a bridal shop, actually be in any way good at selling financial services? I have zero interest or experience in financial matters. Fundamental truth in this situation: I would probably not be good at this because, as mentioned, I have zero interest or skill set. Why does this seemingly professional business man want a teenage girl with zero experience?

As we can see FPT can be a branching system as well, especially when used as an analysis and not as a direct-problem solving tool. Now that we have, using my own experience as an example, uncovered a (just one though, there are potentially many, but we’d be here all day unraveling them all) first principle: I would not be good at this at all.

Asking more critical questions

Our first principle being that I would not be good at this leads into a crucial followup question: Why does this person want to share this amazing business opportunity with me? When considering this from a traditional commerce perspective, especially when the business is selling a product, it makes little sense. In the situation that it is a product, why doesn’t the company sell their product through either a retail outlet or their own website? Why are they using you as a middle man to sell this? Wouldn't they want to keep as much of the potential market for themselves? Why would they willingly divvy up their potential client pool?

Another way to perform this step is to compare it to real world examples. Look at successful businesses or entrepreneurs you know. Do they engage in this business model? Have you ever met anyone who became demonstrably wealthy from a model like this?

In my case, however, the question should be “why is the business professional recruiting a young woman who helps women try on big fluffy dresses to sell insurance?” Doubtlessly financial service firms do need to hire people to manage their clients and find new ones. But shouldn’t a legitimate business be recruiting qualified candidates? Why are qualified candidates eschewed in favor of seemingly naive teenagers?

What conclusions do we arrive at?

Let's have a look at the two major points from the above sections:

- Why are businesses using this model to sell their products?
- Why are they recruiting people without experience or credentials to perform this service?

Firstly, if this was a good product at a good price, would they need a complicated multi-level distribution method to sell it? If this is a good product, why can't it compete with comparable products in an open marketplace? Here we see a failure of the business model product idea—it does not pass the test of being an actual money-making opportunity because if it was a product with the potential to make money, the manufacturer/owner of the product would be selling it for themselves and keeping all the profit made as opposed to diffusing it through multiple levels. Instead of the product itself, you are likely to be the money-making opportunity.

Secondly, why are they recruiting people without experience or credentials to perform this service? Here it is because people with experience or credentials can discern that this is not a money-making opportunity nor a legitimate business model. I had no financial experience so during the meeting I just took for granted that what the business man was saying was true. But when he told me I'd need to pay a couple of hundred dollars for a training course and I'd be an independent contractor and not an actual employee, that's when my natural suspicion clocked in.

Unlike many young people who would be successfully targeted by this not-a-real-business-man, I did have some business and employment experience. Both of my parents ran their own businesses so I was familiar with the basics of running a company, and I already had a few jobs prior to that. Perhaps he was hoping to catch a young person with zero experience, because people with experience will know this is not a legitimate business model. Employers pay you, you don't pay employers.

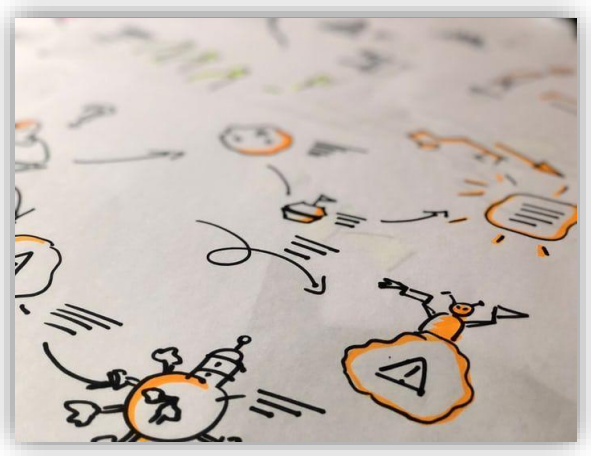
Although more of a conclusion than a solution as we are using FPT as an analysis tool, using the above process we can reasonably be certain that the business opportunity presented to you, if it follows the multi-level marketing scheme, is not a good opportunity unless you have the skills and experience, but if you have the skills and experience you would still be better served by a different business model due to the restrictions on purchasing your stock.

Conclusion

We can use FPT to not only come up with solutions for large-scale problems and community concerns, but also to evaluate new situations on a personal level. FPT can be employed as an analytic process when presented with employment situations that you may be unfamiliar with. At the heart of this analytical process is continuing to ask critical questions to uncover the underlying assumptions and fundamental truths (first principles).

You may also have noticed that I interpret the process somewhat differently than my colleagues here at FIPS may do. FPT isn't a ridgid rubric that you will be graded on. It is a tool to help you discern the logic within a situation, and like many tools the exact way that you apply it is up to personal preference and predisposition. So don't be afraid to use FPT in a way that feels comfortable to you.

Finally, I do not mean to suggest that all business opportunities are bad ideas or predatory schemes. A friend or acquaintance may very well have an excellent, well-thought out business plan that they would like you to invest in. However, these business plans will generally not involve uplines and downlines, direct sales, contacting people out of the blue on social media, or trying to trick teenagers into thinking they should pay five hundred dollars to get a nonsense course in insurance sales.



What I Discovered Writing a Thesis on First Principles Thinking: An Interview with Kmar Hachicha

By Kmar Hachicha and the FIPS Team

Originally published electronically on 20 June, 2021 [5]

In the following interview, Kmar Hachicha, a graduate student from the Technical University of Brunswick, offers the FIPS Team and its readers a unique insight into her novel research on first principles thinking as an innovation process. In the conversation that follows, she tells us about her thesis project, what she discovered as well as her experiences working with first principles thinking.

Can you tell us something about yourself?

I am Kmar Hachicha, 26 years old, and I'm a first principles thinker. I was born and raised in the beautiful country of Tunisia in north Africa. For my studies I moved to Germany in 2014. I studied Biotechnology in the bachelor, and I am currently doing my master in Bio- and Chemical Engineering.

[5] Hachicha, K. (2021). What I Discovered Writing a Thesis on First Principles Thinking: An Interview with Kmar Hachicha. *Factory for Innovative Policy Solutions*. Retrieved from https://www.innovativepolicysolutions.org/articles/what-i-discovered-writing-a-thesis-on-first-principles-thinking-an-interview-with-kmar-hachicha

I also volunteer as a trainer for soft skills and self-leadership. During my studies I worked as a student assistant in the laboratory, as a tutor for project and quality management and as a working student in an engineering company for 3D process flow simulation. I am very fascinated by the methods and tools that make every day's work efficient and goal oriented like the pomodoro-method, or the pareto-principle or 4mat. I read in my free time about the theories concerning human interactions, communication and motivation. I like running and I love good food.

First principles thinking (FPT) is only one of several problem-solving methods. Why did you decide to focus your research specifically on FPT?

For a year I have been hearing about the innovation process first principles thinking and how it promises powerful solutions through the work based on the fundamentals of first principles. As a passionate person for methods this awakened my curiosity. Starting to read about it online and to watch videos and interviews on FPT I realized that except for *First Principles Thinking for Societal Problem-Solving: A Manual to Generate Innovative Solutions to Today's Challenges,* published by the Factory for Innovative Policy Solutions (FIPS), there are no further scientific studies and investigations on the process. Right away I saw the research gap and was determined to take the opportunity to contribute to the development and establishment of first principles thinking. At this point I want to thank Prof. Dr.-Ing. Sabine C. Langer from the Technical University of Brunswick, who is passionate about innovation and curious about innovation topics. She made it possible for me to write my project thesis on the subject and supported me all the way till the end.

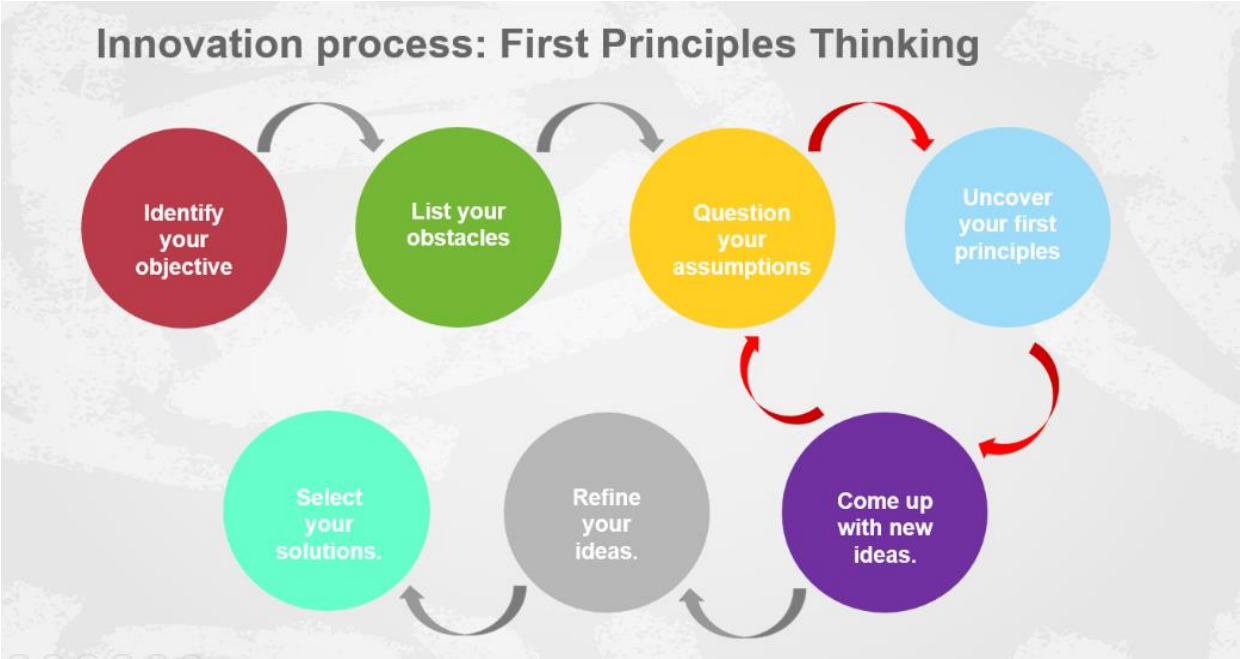
What did your research process look like, and what did you discover?

In my student project thesis I offered interactive online workshops to students, in which they understand FPT and use it in the case study of reducing screen time on their phone, tablet, computer, TV, etc. after work. They worked through the objective of reducing screen time with FPT as a team of 3, adding me as a moderator. At first, I tried to gather every possible description of the process that was available. I then decided to choose the process steps of FIPS since it was the only process description that was detailed enough to be used in practice:

The steps of FPT, according to the first principles thinking manual published by FIPS:

1. Identify your objective
2. List your obstacles
3. Question your assumptions
4. Uncover the first principles
5. Come up with new ideas
6. Refine your ideas (optional)
7. Select your solutions (optional)

In the second step I expanded FPT with the goal of making it less exhausting. So instead of going through all seven steps of the process in a linear way, I added a twist. Originally in step 3 all the assumptions are going to be questioned all at once for all the obstacles. The same for step 4 with uncovering the first principles and in step 5 with coming up with the solutions. The change consists in the execution of the steps 3, 4 and 5 separately for each obstacle alone (red arrows in the flowchart below). So, for example, if the obstacle is no time to achieve your goals, you would first question if you really have no time. Then you would uncover the first principle(s) behind it, which could be that those goals don't really interest you. And from this first principle(s) you come up with a solution or two like finding what really motivates you or booking a seminar with a life coach. Also, when trying to come up with solutions in step 5, it is recommended to use the previously uncovered first principles for the other assumptions and try to combine them for creating solutions.



Flowchart of the process of first principles thinking as investigated in my thesis research

Finally, I offered the workshops as a way of validation of the process of first principles thinking. The participants get to know each other, then discover the process and finally use it in a case study and evaluate it with the help of a survey. I discovered that each workshop leads to different solutions for the same case study. One of the solutions was creating a list with all the activities that could be done, because they realized as a first principle that they didn't know what other possible activities they could do. Another solution was planning beforehand an appointment that occurs after the screen time so that the screen time is limited. I find this personally a proof of the ability of first principles thinking to create solutions that are diverse. Different solutions are developed based on the perceived obstacles and the people going through the process.

In my opinion there are two critical steps in the process of first principles thinking. The first is to take enough time to list all possible obstacles in step 2. If not all obstacles are listed, the solutions won't be as powerful as they should be. Step 3 of questioning the assumptions is very challenging and crucial. It is the step that leads to uncovering the first principles. That's why using all the possible techniques to question the assumptions and to be able to dive deep into each question, making the difference between a fake first principle or a real one, is highly important. It is challenging to find the right questions to ask to question the assumptions with the right facts and arguments. But it has to be done, otherwise the process isn't successful. This step requires a lot of time, a sharp mind and questioning skills.

How did your participants evaluate FPT? Do you agree with their assessments of the advantages and disadvantages?

The participants find that the first principles thinking process is 91% innovative and develops new ideas. 88% of the participants said they would use the process to generate innovative solutions. The process of first principles thinking was shown to be structured and logical. They also found that the implementation of the process in an online setting was very fitting and efficient.

The participants expressed some fears and concerns about step 3 toward questioning the assumptions. They felt that they needed more guidance and methods to use first principles thinking on their own without the support of a moderator. Since questioning the assumptions is a very intensive step with a lot of thinking and analyzing, it gets hard in my opinion to do the thinking and keep an outsider overview on the quality of the questioning. Reaching a thinking blockage while questioning is easy to solve with the help of the moderator and hard when the person who's having the blockage is trying to find a way around it by him- or herself.

The adjustment with steps 3, 4 and 5 as a loop process for each assumption was seen as inefficient by some participants because the solutions sometimes repeated themselves. The repetition occurred through the discovery of further first principles in further process loops of step 3, 4 and 5 that only strengthen previously discovered first principles. I don't agree with the participants on this point, but I see their point about the risk of repetition. Working each assumption separately has more benefits in my opinion. First, the participants focus only on one assumption and work through it till the end without being disturbed or stopping in order to work through another assumption. Second, the loop process in step 3, 4 and 5 enhances the satisfaction of the participants and their motivation. Creating solutions in between is like small success along the big first principles thinking process. This gives the participants the energy to keep going and keep doing the exhausting and extensive work of questioning the assumptions.

How do you believe that the FPT process could be improved? Would you recommend any modifications to a future edition of FIPS' manual?

I believe that the possibility of the loop process for steps 3, 4 and 5 should be taken into consideration when working on a very complex challenge that would take days to solve. I

believe this will keep the motivation and energy to go through all the assumptions lying behind the obstacles. To deal with repeated solutions or slightly different solutions, step 6 to refine the solutions can be dedicated to filter and merge the solutions.

For a further version of the FIPS manual, I suggest a guideline for step 3 with a list of possible methods and question clusters to use while questioning the assumptions. This would empower individuals to use first principles thinking frequently with less concerns or fears of not getting further if they meet a thinking blockage.

Do you think that you will continue to use FPT in the future? If so, how?

Since I got to know first principles thinking deeper and better, I have been using it daily. I am not using all seven steps of the process daily, but I adopted the thinking mechanism of first principles. Whenever I am confronted with a challenge, privately or at work, I think of the obstacles first. I ask myself or people around me: what is keeping us from achieving the goal? Then I start questioning this obstacle till I find the first principle (the fact that I can't further question). Based on this discovery I try to develop a solution.

What I mostly learned out of this experience is that no matter what I think my obstacles are, there is always something else that lies behind them. The obstacles are usually only a shell or a mask that hides assumptions that need to be questioned.

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The First Principles Thinking Review is the first of its kind with respect to its scope and focus. Although first principles thinking can be traced back to ancient times, surprisingly little has been done to develop its potential as a catalyst for societal innovation and progress. It is therefore the purpose of this publication to finally change that status quo. By dedicating the pages of the Review to create an outlet for the theoretical development and practical application of this problem-solving method, the Factory for Innovative Policy Solutions hopes to engage as many inquisitive minds as possible in the realization of this project.

Featured authors

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